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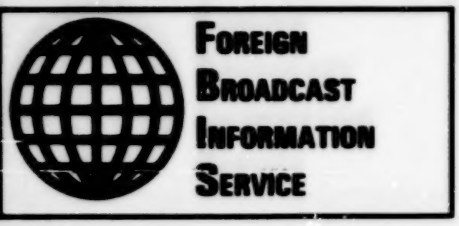

JPRS Report

Science & Technology

USSR: Science & Technology Policy

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Problems of Organizing Joint Enterprises in USSR

18140272 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 7, 5-18 Apr 88 p 7

[Article by A. Androsov and A. Golubovich: "Will the 'Marriage of Convenience' Be Enduring?"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] More than a year ago the legislative basis for the establishment and activity on USSR territory of joint enterprises (SP's) with the participation of Soviet organizations and firms of socialist, capitalist, and developing countries appeared. For us this matter is entirely new (if you do not count the concessions of the period of the New Economic Policy). For comparison let us say that in Hungary at the beginning of 1988 about 100 joint enterprises had been established, in Poland—about 700 joint enterprises, while in China—nearly 6,000 joint enterprises. Today 30 joint enterprises have been registered on USSR territory. Moreover, tens of "Protocols of Intentions" and "Memoranda of Mutual Understanding" have been signed between the partners in the establishment of joint enterprises. Is this many or few?

Of course, it is infinitesimally few, if you bear in mind the tasks that face joint enterprises. This is first of all the acceleration of scientific and technical progress on the basis of the efficient use of advanced scientific and technical achievements and the domestic scientific production potential; the possibility of adapting our scientific ideas and developments, while using the base technology of the partner firm, and, consequently, the further development of the scientific and technical revolution in the USSR. This is also the mastering of the latest knowledge and know-how in the area of production management and in the area of financial and commercial activity and of the methods of organizing marketing and advertising. This is also the attraction of additional physical and financial assets for the speeding up of the restructuring of the Soviet economy, the strengthening of ties with other countries, and the development of good neighbor relations. This is, finally, also appearance on the foreign market and the pulling of other Soviet enterprises up to the world level of the organization of production and the international standards of quality for the output being produced.

If we examine the establishment of joint enterprises and the introduction of foreign scientific and technical innovations in our country from the standpoint of their economic significance, this is first of all the reduction by our country of the expenditures of convertible currency by the amount of the value that is added in the production process, as compared with the expenditures on the acquisition of similar products abroad. Of course, under the conditions of joint enterprises a portion of the added value will go to the foreign partner (in proportion to its contribution to the authorized capital stock of the joint enterprise), but the saving of currency as compared with the importing of this product for the USSR will be significant.

So why, in spite of the obvious advantage, is the number of joint enterprises so small?

The point is that both the already established joint enterprises and the plans, which are at the stage of analysis, are faced with the same problems. For the most part they stem from the inadequacy of the analysis by central economic organs of a number of fundamental principles, which are connected with the establishment of joint enterprises. This is both the estimation of the fee for the right to use land and water and other natural resources (they are a part of the contributions of the Soviet participants to the authorized capital stock of joint enterprises) and the set of questions, which are connected with the personnel of joint enterprises and the remuneration of their labor (thus far the question of the fee for manpower resources, which is envisaged for Soviet state enterprises, is unclear). How is one to establish the price for the product of a joint enterprise for the domestic market (in case of the establishment of prices for the product of a joint enterprise it is impossible to any extent to use the methods that are employed by foreign trade firms in case of conventional contract purchases) and to extend credit to joint enterprises, what should the customs duties be for goods, which are purchased abroad for the support of the basic activity of joint enterprises?

Thus far there is extremely little information, which specifies and explains the general procedure of the establishment and activity of joint enterprises. This leads in the majority of cases to the lengthening of the time of negotiations with a potential partner and the need for the Soviet founder when clarifying some simple question to "run" about all instances. Moreover, quite often it turns out that this question has not been settled at all and the Soviet participant must make a decision independently.

The question of estimating the contribution of the Soviet side to the authorized capital stock of the joint enterprise is one of the key questions when establishing a joint enterprise. The right to use land, water, and other nature resources; the cost of the building (designing, the expenditures on construction and installation work) and equipment, and monetary assets are included in the calculation of the contribution of the Soviet participant. Specific types of contributions are also encountered—the entry in the authorized capital stock of the joint enterprise of the expenditures on housing and civilian facilities (this contribution at times comes to up to 10 percent of the amount of the authorized capital stock), the fee for the manpower resources made available to the joint enterprise, objects of engineering and technical support, and so on. But thus far there are no precise quantitative estimates of these types of contributions. As a consequence, the confusion in this matter has the result that a lack of confidence of the foreign partner in the Soviet side arises.

It is impossible to accomplish these tasks without the organization of the most diverse joint enterprises. The point is that all the traditional channels of obtaining new

technology: trade in licenses and "know-how," the purchase of equipment, and even the "turnkey" construction of plants, do not guarantee the obtaining of the latest achievements of foreign firms and their subsequent efficient use. According to data of the foreign press, more than half of the licenses, which were sold by West European countries to CEMA member countries, were patented from 5 to 10 years ago. In other words, they reflect not "tomorrow's," but "yesterday's" and even "the day before yesterday's" level of technological process. The period of the assimilation of innovations in accordance with licenses, which have been purchased by Soviet enterprises, also proves to be too long.

Joint enterprises are joint risk and joint production, this is the interest of both partners in the efficient operation of the enterprise. This is a kind of "matrimony" of the parties, when extreme trust, responsibility, and interest in a mutually profitable future are needed.

For many joint enterprises even the calculation of the economic efficiency of the design of the joint enterprise during the preparation of its technical and economic substantiation is becoming a problem. Much is being said today about the necessity of the calculation of the economic impact of capital investments in the establishment of joint enterprises, in new equipment, in licenses, and in "know-how." But it is possible to add to the well-known expression "so many men, so many opinions" "so many methods." Today another duty is being assigned to the Soviet participant—"to examine creatively" all the proposed diversity of approaches when preparing the technical and economic substantiation of the joint enterprise.

Let us also speak about another of the most important aspects of the future life of the joint enterprise. In order to derive an impact from this form of foreign economic cooperation, which is new for us, it is necessary to achieve a reduction of currency expenditures on the supply of Soviet consumers with the high-quality products they need. Otherwise the joint enterprise may turn out to be for the national economy the same kind of "load" as imports. In other words, joint enterprises should be self-sufficient with respect to currency.

Under the conditions of the inconvertibility of the Soviet ruble the currency self-sufficiency of joint enterprises is becoming a key issue. This is especially important as in many cases a contradiction between the needs of the domestic market and the unsatisfied demand and the need to put an end to dependence on imports, on the one hand, and the currency resources of the country, on the other, arises.

At the same time, and this is by no means a secret, the foreign partner is interested first of all in developing the Soviet market while using the highly skilled labor of Soviet specialists and local sources of raw materials. For the majority of foreign partners it is unprofitable to establish in the USSR enterprises which may become competitors for them on the markets of third countries. The experience of establishing joint enterprises with multinational corporations (TNK's) shows that in case of the joint production of a product in accordance with the technology of multinational corporations restrictions are nearly always imposed on exportation.

Thus, during the first years of operation of a joint enterprise it is difficult to count on the rapid development of the export of products. Therefore, it seems advisable to orient joint enterprises first of all toward the output of products, which replace imports, and the achievement of efficiency at the national economic level. Here the necessity of paying a portion of the cost of the products of joint enterprises, which are delivered to the domestic market, in freely convertible currency arises. Such a possibility is envisaged by the decree of the CPSU Central Committee and the USSR Council of Ministers "On Additional Steps on the Improvement of Foreign Economic Activity Under the New Conditions of Management." Unfortunately, the questions of the establishment of a currency quota in the price of the product of the joint enterprise on the domestic market, the interaction of the joint enterprise with foreign trade organizations, which sell the product of the joint enterprise on the USSR market, and the consideration of the conditions of the world market when establishing domestic prices for the product of the joint enterprise still remain unresolved.

The lack of rapid information on questions of the establishment and activity of joint enterprises and the lack of a system of the sharing of the experience, which has been gained by the founders of joint enterprises, are also having an extreme effect on the pace of the establishment of joint enterprises on USSR territory. In order "not to invent the bicycle" and to avoid the already made mistakes, it is necessary, in our opinion, to organize permanent seminars on the current problems of joint enterprises and to establish a kind of "business club," where the managers of established joint enterprises and specialists in the field of foreign economic activity could share experience.

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New Agency Created for Scientific-Technical Progress Control

18140250a Moscow SOVETSKAYA ROSSIYA in Russian 29 Mar 88 p 1

[Interview of engineer Igor Mikhayhlovich Yashin, secretary of the USSR Union of Scientific and Engineering Societies, by M. Komarovskiy: "Inspiration and Cost Accounting"; letter and first paragraph are source introduction]

[Text] "At the recently held 7th All-Union Congress of Scientific and Technical Societies, a decision was adopted on establishing a new creative union—the USSR Union of Scientific and Engineering Societies.

What made such a measure necessary? Would not the result be as has already happened many times that the nameplate will change but everything will essentially remain as before? In the final analysis, inventors, engineers and scientists do not care who will help them—the scientific and technical society or the new union. The important thing is for help to be effective and aimed at the acceleration of scientific and technical progress. But so far we have not felt it at all.

"N. Chernyayev, scientific associate Moscow."

We have asked I.M. Yashin, secretary of the new union's board to answer the letter's author.

[Answer] Scientific and technical societies are doing much for the development of production. Each year they develop and turn over more than a million different proposals for use in the national economy and take part in the solution of serious state problems. They have developed a technology of comprehensive use of ferrous-metallurgy slag, corrosion inhibitors for the petrochemical industry and new antifriction self-lubricating plastics. These innovations have already produced an effect in production worth many millions.

But of late a discrepancy in the forms and methods of work of scientific and technical societies relating to the needs of scientific and technical progress and the rate of acceleration of development of the country's economy has become increasingly more apparent. Now the chief aim of many organizations is only indicators—growth of the size of members and increase in the number of held conferences, meetings and discussions.

The practical results of the work of a number of organizations and societies, for example, in Maritime and Stavropol krays and Chita Oblast, simply cannot stand up against any criticism. Inaction is often covered up. Of course, replacement of enterprise with the appearance of activity and the absence of any real returns cannot help but affect the prestige of scientific and technical societies.

At the present time, when radical changes are taking place in the life of the country, an acute need has arisen for awakening the enthusiasm of the scientific and technical intelligentsia and for maximally using the tremendous intellectual capabilities of innovators. For this reason, the creation of the USSR Union of Scientific and Engineering Societies is not just the replacement of a nameplate. The new organization is bound to become the foundation of a public system of control of scientific and technical progress that presupposes broad participation of scientists and engineers in the solution of questions of development of science, technology and production, satisfaction of their creative and professional interests, public discussion of the scientific and technical policy of economic organs and public control over the realization of adopted programs.

[Question] Such a reorientation of scientific and technical societies evidently will require a serious reorganization of the forms and methods of work of scientific and technical societies?

[Answer] Yes, life itself has determined the new approaches. Here is one of them. In Moscow, Kharkov, Kazan and Penza, scientific and technical societies are establishing temporary creative collectives for uniting specialists in the solution of concrete production problems. They work according to cost-accounting principles on contracts with enterprises for many of which, especially the small ones, such cooperation has become practically the only possibility of developing new technology, establishing the production of modern products and modernizing equipment. Last year, the effect of realization of developments of temporary collectives amounted to several million rubles.

In many of the country's regions, cost-accounting centers have been opened for scientific and technical services. In the course of an incomplete year of operation, one such center alone—attached to the Moscow City Council of Scientific and Technical Societies—completed more than 30 orders of the city's enterprises and organizations. They include those that are not considered prestigious but extremely necessary to city plans for modernization of schools and institutions in regard to health care, culture and the municipal- and personal-services sphere.

Cost-accounting centers have the possibility of accomplishing promising scientific-research and design themes without a specific client. These operations are financed from their own risk fund. But cost accounting, as we know, teaches one to take risks intelligently and justifiably. The result is that the centers are undertaking to provide advances for the realization of ideas promising big economic and social gains. These include, for example, the design of a system for laying road pavements whose productivity according to estimates will grow three- to fourfold compared to existing machines.

Now one of the basic principles of the work of scientific and technical societies is to be self-support. Whereas formerly they primarily existed on the basis of membership dues, now they have the right to earn their own money and use it as they see fit without stringent control from above.

The limited experience so far of temporary creative collectives and centers of scientific and technical services has shown that work in them is performed two to three times more quickly than at specialized scientific-research and planning organizations, it even costs several-fold less dearly.

[Question] Igor Mikhaylovich! It is well known that many highly effective inventions necessary for the national economy are halted in their development at the introduction stage. It becomes especially difficult for an individual inventor to "break through," although quite

frequently a talented person succeeds in accomplishing that which entire institutes unsuccessfully are desperately trying to do. What aid can the Union of Scientific and Engineering Societies provide to inventors and innovators for the introduction of their developments?

[Answer] Actually, many inventions gather dust on shelves for years and decades, although their use in production could provide an appreciable effect. One of the chief reasons for this is narrow departmentalism and a reluctance to use other people's developments.

In order to get going, we recently adopted a decision on the creation of public consulting offices under central and local governments, regional soviets and certain primary organizations whose functions would include a qualified assessment of inventors' and innovators' proposals and a resolution of the question of the possibility of their use in the national economy. The first practical results of such work have already been forthcoming. For example, A.D. Rafeyenko, a brigade leader of the emergency repair service of the city housing administration, turned to the consulting office attached to the Kaliningrad Oblast Council of Scientific and Technical Societies. Over the course of many years he had tried unsuccessfully to introduce several of his inventions, which included a device for automatically regulating the illumination of stairways, an electronic contact manometer for automatic regulation of water supply in heating systems and other devices offering significant economy of electric power, fuel and water as well as easing the labor of personnel of city services. The oblast council decided to organize an exhibition of these inventions and invited to it all interested organizations. After this, a specialized experimental section was created under the oblast administration of housing and municipal services for the development and introduction of technical innovations which were headed by the author himself, that is A.D. Rafeyenko.

Public consulting offices have to solve the problem in reverse: on the request of enterprises to look for inventors or engineering collectives who are ready to provide concrete scientific and technical assistance to production. Let us say that specialists of the Vologda-1 Electric-Locomotive Depot, having run into a problem with heating electric motors in the course of maintenance of electric locomotives, turn to the consulting office of the Vologda Oblast Council of Scientific and Technical Societies. The public consulting office has involved in this work staff members of the Department of Heat Engineering of the Vologda Polytechnic Institute who developed the required unit and fabricated an experimental model of it.

Competitive selection of designs is very important for the solution of scientific and technical problems. Only a broad discussion of proposed solutions and a comparison of the pluses and minuses of different variants can ensure a fast rate of moving ahead. In this sense, the experiment conducted by us together with Central Television in the showing of "An Idea Is Needed" is most significant. It was proposed to television viewers to find a method of discharging mazut from railroad tank cars at low temperatures. This problem is of major national-economic importance. Solely because of above-norm layovers of tank cars in the wintertime, the state loses annually almost 50 million rubles.

The results of the television competition exceeded all expectations. We received 14,000 proposals among which there were many promising solutions.

This example convincingly shows what a vast potential for scientific and technical ideas exists in our country and how many talented scientists, engineers and inventors have been yearning for vital, creative work.

[Question] What societies will be included in the new creative union?

[Answer] So far the union includes 24 scientific and technical societies that formerly operated within the framework of the All-Union Council of Scientific and Technical Socieities. Altogether they unite approximately 13 million persons—engineers, scientists and innovators of production. Another two societies are now being created—for the aviation industry and for information science and computer technology. Furthermore, the question is being discussed of having certain scientific societies of the USSR Academy of Sciences, the Medico- Technical Society and others join the union. But I repeat once more that we are interested not so much in the number of societies included in the union as in practical results and effectiveness of their work. Such an approach is dictated by the radical economic reform.

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Measures to Accelerate S&T Policy Formulation

18140342 Moscow PLANOVOYE KHOZYAYSTVO in Russian No 6, Jun 88 (signed to press 23 May 88) pp 49-58

[Article by Professor D. Palterovich, doctor of economic sciences]

[Text] The measures which are being taken for the acceleration of the scientific and technological progress and increase of its input into the growth of the production effectiveness have not yet brought the expected results, and the lagging behind the world level in a number of leading areas of engineering and technology is not yet reducing. The main causes are the insufficient and structurally irrational expenditures of funds on NTP [science and technology policy], weak interest of enterprises in the development and introduction of new equipment, low level wages of scientists, engineers and technicians, lagging in the development of the material and technical base of science and scientific instrument making, gaps in the "science-equipment-production" cycle and the substitution of the economic methods of NTP control with administrative and order methods.

The radical economic reform which is being carried out requires new approaches to the formation of the science and technology policy and to the determination of its goals, functions and, particularly, the mechanism of its realization. The science and technology policy is a complex and many-sided concept. It must determine the most important directions of the scientific and technological progress and the main scientific and technical programs, to rank their priorities for medium and long ranges, to distribute the means and resources over the planned directions and programs, to form the organizational structures of NTP control facilitating the most rapid development and practical utilization of the most important and promising achievements of science and technology, and to create a system of economic stimuli ensuring the acceleration and growth of the effectiveness of the scientific and technological progress.

The science and technology policy is closely connected, firstly, with the structural policy, since NTP shows itself in a real social production in the changes of the structures of the techniques, technology and production and, secondly, with the investment policy, since the scientific and technological progress depends on the scale, structure and effectiveness of capital investments; thirdly, with the socioeconomic policy as a whole, since the science and technology policy must be directed toward immediate achievement of the most important social and economic goals, and, finally, with the overall process of the improvement of the economic mechanism part of which is the NTP control mechanism.

The term "science and technology policy" is customarily combined with the word "unified". Evidently, its unity implies its overall state control, the development of the leading NTP directions on the basis of statewide interdepartmental programs, efforts to introduce the highest technical achievements in all industries, at all enterprises, etc. However, it seems, that unity is only one of the characteristics of the science and technology policy which, incidentally, has a limited sphere of applications, for example, the introduction of a certain type of advanced technology at rather similar plants of various enterprises.

At the same time, no less important, if not more, are such properties of the science and technology policy as flexibility and adaptiveness, the ability of adopting to concrete conditions of the real production. It is quite evident that both the priorities in selecting NTP directions, and the ways of their realization are different at various stages of development, in various countries, industries and even enterprises of one industry. This suggests an important practical conclusion about the impermissibility of uncritical borrowing of foreign experience, as well as the introduction of similar equipment in various production conditions. Frequent attempts to ignore concrete conditions of the use of equipment, for example, the use of similar methods of robotization or introduction of computers at enterprises with different standards of production, series production, levels of personnel skills, etc, are often unrealistic and even damaging to the national economy.

In order to have a deeper understanding of the role and functions of the science and technology policy, it is necessary, first of all, to characterize the scale and complexity of the system which the scientific and technological progress represents. In each of its subsystems, such as the spheres of scientific research and technological development, planning and design, introduction and putting into production, operation and maintenance of the operating efficiency of new equipment, both the number of potential possibilities and directions of development as well as the difficulties of their realization are rapidly increasing. These difficulties are connected with objective causes (NTP nonuniformity in space and time, shortage of capital investments, production capacities and resources, complication of connections and interactions of various NTP directions, industries and plants), as well as such subjective factors as the weakness of the stimuli, lack of coordination among the constituent parts of the scientific and technical progress, and departmental and other barriers among them.

The USSR Academy of Sciences alone has many dozens of NII [scientific research institutes] concentrated in its departments each of which usually has projects under development and completed projects on a number of directions. The new generations of computers and program carriers, nuclear particle accelerators and powerful telescopes, lasers and holography, achievements in optics and ultrasonic technology, methods of complex processing of ores and hydrocarbon raw materials, new methods of obtaining energy, biotechnology and genetic engineering—all these and many other scientific achievements promising a considerable effect in the near or remote future require considerable expenditures and resources. Moreover, each direction can develop successfully only when interacting with the number of other scientific achievements and types of technology.

The institutes of the USSR Academy of Sciences have only about four percent of all scientists, and industrial NII[1] are also conducting work in many directions.

In 1986, 87,000 of certificates for invention were issued, four million inventions and rationalization proposals were used for the first time in industry, 3,100 specimens of machines and instruments were developed, more than 4000 new kinds of industrial products were put in production; expenditures on science amounted to 29.5 billion rubles, and the expenditures on the introduction of measures on new technologies in industry were 13.5 billion rubles. With these scales of scientific and technical activities, rational distribution of funds and resources for the directions, development and organization of the fulfillment of the scientific and technical programs in their interconnection and the creation of more effective stimuli for the development of NTP acceleration in all sectors of the national economy are the tasks and functions of the state science and technology policy which become vitally important conditions for progressive development of the economy.

Of course, the total amount of expenditures on NTP depends not only on scientific and technical factors. It is determined, first of all, by the size of the national income, its distribution and effectiveness of the utilization of the accumulation fund and the consumption fund, as well as by the needs in funds for solving foreign-policy and defense problems. However, the amount of funds which is expedient to allocate for NTP depends greatly on how effectively the science and technology policy is carried out and how fast it ensures the return of the invested funds for solving current and promising socioeconomic problems. In other words, the more effectively the science and technology policy is carried, out, the more yield is produced by the funds allocated for NTP and the more significant must be their total amount.

The main goal of the science and technology policy is to ensure the acceleration of the technological progress as the most important strategic reserve for the development of the economy, growth of labor productivity, improvement of the welfare of the workers, overcoming the scantiness of natural resources and protection of the environment against pollution. It is with consideration of these goals that the selection of NTP directions, as well as their priorities, must be carried out.

At the present stage of the scientific, technical and socioeconomic development, this selection has to be done under the conditions of the aggravated contradictions between long-term and medium-term goals, as well as between the tasks of the development of fundamentally new, traditional and modernized equipment. The technical policy is intended for ensuring their optimal combination and, at the same time, to facilitate the overcoming of global contradictions between the necessity of accelerated development of production and the harm it does to nature and man. This harm can be prevented only by switching from the traditional technologies for obtaining energy, construction materials and agricultural produced to fundamentally new resources-conserving and harmless technologies.

The potentialities of resources-conserving technologies are so great that they can substantially change the structure of modern production. For example, the experience of some industrially developed countries showed that in 10-15 years it is possible to lower the energy consumption of the national income to about two-thirds. And this is under the conditions when many fundamentally new technologies, such as, for example, integrated energy-consuming technological processes minimizing the losses of heat and energy, are not yet developed. theoretical minimum consumption of energy for the production of basic materials according to academician V. A. Legasov's data is lower than that of the best western firms, for steel—1/4, aluminum—1/6, cement—1/5, paper—1/125, for oil refining—1/9[2].

Although the theoretical minimums are unattainable in the foreseeable future, many technological successes have already been achieved. For example, according to the published data, pulp and paper enterprises of Sweden have reduced the consumption of water to 1/20th. It can be easily understood that the use of this technology reduces not only the need in the water resources, but also the consumption of power and pollution of lakes and rivers by the drainage water of pulp and paper combines.

The latest technologies ensure not only the conservation of resources, but also their total utilization, utilization of wastes, reduction of the amount of the materials used, as well as a reduction of harmful effects on the environment and man. Therefore, the realization of the requirements of the new technological stage of NTP must be used as a basis for the development of the state science and technology policy.

The above does not mean that the main part of funds and resources should be directed toward the development of fundamentally new technologies which are the most important strategic reserve. It is important to keep in mind not only the degree of readiness of these technologies for their effective application, but also the availability of huge tactical technological resources connected with considerably lesser expenditures and risks. Considering the very strained situation in almost all spheres of economy (at least for the next few years, it is expedient to limit expenditures on fundamentally new equipment and technologies which do not promise immediate yield. The main part of the funds allotted for the realization of the science and technology policy should be directed for wide dissemination of new technologies and production organization methods which have already proven their effectiveness. They are, for example, continuous steel teeming, "dry" methods of cement production, rolling of parts, various methods of obtaining precise blanks, construction from large-size elements, intensive technology of growing grain crops, etc. Research and development should be directed toward wide introduction of these technologies, as well as to reconstruction and reequipment projects, production of equipment, improvement of the organization of production and the entire system for controlling the scientific and technical progress. At the same time, it is necessary to increase long-term scientific research for the future.

Along with the ratio between the strategic and tactical directions of NTP and between the fundamentally new and modernized equipment, the effectiveness of the science and technology policy is greatly influenced by the distribution of the allotted funds and resources, firstly, between the basic and applied research, secondly, between scientific research, experimental and design development and the introduction of their results into industry and, thirdly, between such NTP directions as mechanization, automation and introduction of the latest technologies, including electrophysical, electrochemical, laser, plasma radiation, membrane, pulsed, biotechnology, and others. The analysis of the proportions requires special study, therefore, I shall limit myself to individual examples.

According to the available rather fragmentary or estimated data, the existing ratios of expenditures for each of the above-mentioned structural sections are far from optimal. For example, according to some specialists, for each unit of their scientific research there should be ten units of expenditures on experimental design work and tests of new equipment and technology and hundred units on their introduction. Unfortunately, the absence of statistics on the expenditures in this respect makes it impossible to evaluate the actual situation quantitatively. However, it is known what a serious hindrance along the path of the introduction of new advanced development is the lagging of the experimental base. Moreover, the expenditures on the introduction of new equipment and technology are obviously insufficient. As it has already been mentioned, they were 13.5 billion rubles in 1986 in industry. If we assume that for the national economy they were twice as high then the expenditures on introduction will still be substantially smaller than the total expenditures on science. It is quite evident that the centralized method of forming such proportions in the absence of sufficient interest of scientific organizations in bringing the results of their research and development to the final consumer led to an irrational distribution of expenditures between the stages of the development and introduction of new equipment.

The same refers to the ratios of funds and resources for such directions of re-equipment of production as new technologies, mechanization, automation, updating of equipment and others. Even in the not so distant past, the priorities and scales of expenditures were determined without proper substantiation and often without estimating real potentialities of the development and economic effectiveness of each NTP direction. This resulted in errors which have already done considerable harm to the national economy and which must not be repeated in the future.

Let us examine the reserves connected with the technology policy on the example of the ratio of funds and resources directed for the development of flexible automation and advanced technologies. Calculations have shown that expenditures on the introduction of advanced technologies in industry were reimbursed in 1970 1.5 times faster, and in 1985 almost four times faster, than expenditures on automation. However, the portion of advanced technologies in the total expenditures on measures for improving the technical level of production in industry dropped during that period from 53 to 37 percent, and the portion of automation (including the introduction of computers) increased from 10 to 23 percent. Moreover, the funds directed for the automation of backward technologies often produce no effect at all.

Serious errors were made in the development of tasks for flexible automation according to which it was planned to produce during the current five-year plan more than 100,000 robots, 30,000 flexible production modules and approximately 2,000 flexible production systems, i.e., 8-10 times more than there were in the world in 1985. Expenditures on this insufficiently developed in most instances unprofitable equipment which was forced upon enterprises will amount to several billion rubles, a considerable part of which could have been directed for more effective measures.

It is frequently mentioned in economics literature that the effectiveness of expenditures on automation must be considerably increased by radical re-examination of both the volume, and the structure of the means and systems of flexible automation and rejection of "natural economy" methods when it is introduced. In this connection, the criticism to which Academician L. N. Koshkin[3] regularly subjects advocates of robot engineering and other forms of flexible automation is of scientific interest. Trying to prove the preferability of rotor and rotor-conveyor lines as less expensive and much more productive tools of work, he almost completely rejects the expediency of the use of robot engineering.

In our opinion, the analysis of this position has two aspects. For the overwhelming majority of plants the very problem of selecting between flexible automation and rotor lines is not appropriate, since the rational areas of the application of these types of equipment are fundamentally different: for rotor and rotor-conveyor lines, it is mass and large-series production, and for flexible automation, it is chiefly series and small-series production. However, under the conditions of limited means and resources allotted for new equipment, there is always a choice between more and less effective directions of capital investments for the national economy. In this sense, L. N. Koshkin's position has some basis: the lack of funds for the creation of rotor and rotor-conveyor lines and for the expansion of the area of their economically rational application can be filled by part of the funds directed toward the development of that robot engineering which is still not very effective or unprofitable.

However, it would be a mistake to ignore the promising possibilities of flexible automation. The experience of foreign firms and advanced domestic enterprises indicates that, when this equipment reaches its high maturity and reliability, is developed and introduced by specialized firms, two or three shifts are used, is maintained skillfully and performs many kinds of technological operations (assembling, welding, painting, etc), this period of its reimbursement is usually 2-4 years.

At the same time, experience indicates that the policy of wide introduction in the next few years of equipment of the highest world level understood, usually as the level of the best (and, as a rule, very expensive) individual specimens of leading foreign firms often leads to negative results, for example, to removal of old but inexpensive, reliable and effective machines from production and their replacement with insufficiently developed and much more expensive designs. The quest for the highest world level caused billion-ruble expenses on insufficiently mature equipment not quite ready for wide use

and stimulated attempts to develop and introduce it on the principles of "natural economy", giving unproductive equipment to enterprises.

Incorrect understanding of the nature of the highest world level and underestimation of the necessary conditions and the deadlines for reaching it often make people forget that each specific industry is characterized by its own optimal level of equipment and technology. In order to raise it, it is necessary first to change the nature of the concentration and specialization of production, and sometimes even the design of the product, to train the personnel and other conditions. Moreover, the transfer of high-level equipment from one country to another can be effective only in the absence of, at least, sharp differences in the number of workers replaced by this equipment and the level of their wages. For example, in the U.S.A., a robot costing 100,000 dollars which replaces one worker earning 25,000 dollars a year will pay for itself in four years, while in our country it will pay for itself in 20-25 years through savings in the wages with deductions for social security and the appropriate amount of public consumption funds. The equipment corresponding to the world level under our conditions must pay for itself during normative periods of time, and our consumer, just as a foreign one, must have a sufficient selection of traditional, new and latest equipment of various levels and various costs.

Economically rational distribution of funds and resources among the NTP directions is the most complicated problem of the science and technology policy. Even when the adopted (and not at all satisfactory) methods are used for evaluating economic effectiveness in order to compare directions satisfying interchangeable needs, it is difficult to solve this problem due to the high degree of uncertainty of the numerous components of expenditures and the effect. But it is much more difficult to select among the NTP directions and types of equipment and technology satisfying different needs, particularly, in various industries or subindustries.

For an example, let us take the chemical technology together with related scientific and technical areas. When we talk about increasing the power of chemical plants for obtaining a certain product or about the use of new technologies in them (plasma, pulsation and other technologies increasing their productivity by several times), the choice can be based on the existing effectiveness calculation methods. For example, in the case of complex processing of the richest nepheline deposits (instead of bauxite deposits which are nearing exhaustion), the production cost of aluminum-containing raw material (aluminum oxide, is more than 40 percent lower than the average costs for the industry. According to Academician N. M. Zhavoronkov's data, per one ton of aluminum oxide, it is possible to obtain simultaneously (at a considerably lower production cost) 0.7 ton of soda ash, 0.3 ton of potash, 7-8 tons of portland cement and 40 g of the rarest element, gallium[4]. Evidently, it is necessary to determine the required capital investments, to calculate the pay-off period and, on its bases, to solve the problem of constructing units at cement plants. Of course, here too, the volume of the allocated funds and resources depends on many factors, but the effectiveness of the scientific and technical direction itself and the necessity of the reorientation of capital investments allotted earlier for the development of the above-mentioned production according to outdated technologies can be easily verified.

However, if we examine the problems of overcoming lagging in the chemical science and technology more widely, then there will be a large number of alternatives, for example, such as the development of new types of plastics, composites or ceramic materials with special strength, thermal and other properties, increase in the investments into the development and introduction of corrosion control methods, technology of thorough oil refining, coal and timber processing, to the solution of problems of obtaining particularly pure substances for electronics and other industries, problems of catalysis, organic synthesis, small-scale chemistry, etc.

Whether we refer to physics or biology, or examine the prospects of the development of power engineering or machine-building, we shall encounter many alternatives and many directions and problems whose solution requires considerable funds, resources, production capacities and skilled personnel. No country can develop simultaneously all areas of science and technology. But how can funds and resources be distributed effectively among industries, directions and programs which have to satisfy different needs and achieve different goals? Evidently, this is the most complicated task of the science and technology policy. Since there are no exact methods for its realization and the proportions are determined spontaneously in practice, often not in an integrated way and irrationally, it is necessary, at least, to regulate the approaches to and procedures for making such decisions, defining the priorities, deadlines and sequence of the allocation of funds.

The procedure of NTP plan development must ensure the most rational distribution of funds and resources at each level of planning. It seems that a serious shortcoming of its formation at all levels is that this plan is developed primarily by combining (summation) of various directions or measures, and the proportions among them are formed spontaneously, without preliminary economic substantiation. As a result of this, funds which should be directed for more effective measures are often spent on measures which are not very effective.

Therefore, when developing the plan, it is necessary first to determine the total amount of funds which can be allocated for NTP (for the national economy, industry, enterprise), and then to distribute this amount by the directions: mechanization, automation (traditional, flexible, robotization, and others), advanced technology etc. The funds must be distributed by a group of the most

skilled experts on the basis of retrospective data, effectiveness and prospects for the development of various directions, foreign experience, available scientific research in progress etc. Controversial problems must be widely discussed by specialists.

A program can be developed on a competitive basis for each direction, and the funds for the program would be distributed for concrete measures. Thus, the NTP plan will become a result of deliberate distribution of the available resources.

Centralized capital investments and resources must be distributed among the NTP directions and scientific and technical programs on the basis of a thorough scientific examination by experts with calculations of the comparative socioeconomic effectiveness of the latter. Such examinations could become a part of the development of the Integrated Program of Scientific and Technical Progress. This will make it possible to show not only the directions in the program, but also their priorities and to optimize the distribution of limited resources among them.

Funds for basic research conducted chiefly in academic institutes must be distributed first by the areas of science (branches of the USSR Academy of Sciences, Republican and Industrial Academies), and then, on a competitive basis, by the directions of research or problems. in the competitive distribution of budget allocations, scientific councils must play the deciding role. In this case, each such council will become a manager of the fund of means allotted for the development of a certain scientific direction or the solution of particular problems. In the same way, the funds for the development of production, science and technology formed at enterprises, in associations, ministries and other organizations will also be distributed on a competitive basis by decisions of scientific or technical councils. Of course, the composition, organizational structure and the procedures of the activities of such councils must be adapted to the solution of this complicated problem.

In general, the competitive procedure of the distribution of funds for research and development, implementation of measures on new equipment and competitions of customers and executors must, in our opinion, become the necessary element of the entire system of NTP control and powerful stimulus for increasing NTP effectiveness. Moreover, it is important for the competitions to be open to everyone. However, experience shows that there have not been sufficient decisions about the possibility of announcing competitions for their wide distribution when selecting technical projects, executors and customers. Such decisions will remain to be purely formal until strict sanctions are established for noncompliance, down to the prohibition of financing and repayment to the state of the costs of jobs conducted in violation of the established competitive procedure of issuing orders and selecting projects.

It is clear from the above that competitive distribution of funds intended for NTP must be implemented not only at the level of the national economy but also at the level of industries and production associations. The need in capital investments has to be determined not for the development of one or another industry, but for solving specific problems connected with the satisfaction of needs, increasing the effectiveness of the economy and formation of progressive proportion.

An example of how the industrial principle of fund distribution hinders the formation of rational proportions is the ratio between steel and plastic pipes. In 1987, the USSR produced 20 million tons of steel pipes, while the U.S.A. produced approximately one-fourth of that. On the other hand, the U.S.A. produces several times more plastic pipes each ton of which is equivalent to 5-7 tons of steel and cast-iron pipes. Although, operational properties of plastic pipes are considerably higher with respect to a number of parameters than those of metal pipes, it is not planned to eliminate this lagging either during the 13th Five-Year Plan or later[3]. It is evident that if the volumes of capital investments were determined not for chemistry and metallurgy, but for meeting the needs of national economy in pipes, these proportions would have been more rational.

One of the decisive factors of the scientific and technological progress is the creative potential of science whose formation is hindered more and more by insufficient incentives for the work of scientists and engineers. At the present time, the average level of wages in the sphere of science and scientific services is lower than in industry, construction and transportation, which does not attract the most talented and skilled workers to this sphere. When determining the proportions of wages for the future, it is necessary to have two alternatives in mind: either to return to science its priority with respect to the level of economic incentives together with moral prestige and the possibility of attracting talented people, or to aggravate the existing serious lagging of science with respect to public needs and the world level. The considerable funds necessary for increasing the salaries of scientists can be obtained by intensifying their work, reducing their number and increasing the yield of capable scientific workers both on their main jobs, and when they hold more than one job, including in scientific and technical cooperatives.

The establishment of new interrelations of enterprises both with centralized control agencies, and with the sphere of scientific research and experimental and design development is of special significance for increasing the effectiveness of NTP. These interrelations must substantially change the nature of the science and technology policy and the ratios between its forms and functions which are realized at the level of the national economy, industries and enterprises.

The replacement with administrative-order methods of NTP management economically means that ministries

and departments will no longer be able to force enterprises to manufacture or introduce new equipment contrary to their economic interests. Administrative agencies will have to influence enterprises by means of state orders advantageous to them which are distributed on a competitive basis. The issuance of orders for development, putting into production and manufacturing of new equipment presupposes the necessary conditions for their execution, coordination of intersectorial and intrasectorial relations, allotment of material and technical resources, establishment, if needed, of specialized engineering and installation firms, etc. With respect to the leading directions of the scientific and technical progress which are of great significance to the national economy, these duties, in our opinion, must be performed by GKNT [State Committee on Science and Technology].

It is time to recognize that the hopes which were pinned on intersectorial scientific and technical complexes in the area of the development of the most advanced NTP directions for the most part did not materialize. Most of them are not powerful and effective scientific and technical associations, but are conglomerates of organizations and enterprises torn by departmental contradictions and, therefore, incapable of concentrating all resources and efforts on the solution of promising scientific and technical problems of enormous state-wide importance. An example of the lack of coordination between departments is the MNTK [Intersectorial Scientific and Technical Complex] "Svetovod" [Light Guide], which not only did not overcome, but increased our lagging in this area.

In our opinion, it is necessary to fundamentally change the organizational structure, subordination and the financing procedure of intersectorial scientific and technical complexes. First of all, it is important to strengthen the role of GKNT which could have an overall control of their formation and activities. However, the direct control of the enterprises and organizations of MNTK must be the responsibility of councils of directors and not industrial ministries and departments. In this case, MNTK will become cooperative associations of enterprises and organizations and a kind of socialist scientific and technical corporations.

The various forms of cooperation can be widely developed in the structure of NTP control. These will be engineering, technical, design and installation cooperatives and temporary cooperative scientific bodies formed at individual enterprises and organizations for solving concrete problems, associations of state and cooperative scientific and installation organizations and others.

Under the conditions of full economic accountability and self-financing, the problem of creating powerful internal impulses in enterprises for the acceleration of the scientific and technical progress becomes particularly acute. It is important to take into consideration that they will prefer the equipment and technology which have already proven their effectiveness, and this will do harm to the development of the fundamentally new NTP directions. The change of industrial and other NII [scientific research institutes] to self-financing may have similar effects: they will reduce the development of the latest equipment.

What can be used against such negative tendencies? Firstly, a rational combination of centralized and decentralized sources of financing and stimulating promising researches and development; secondly, a changeover of enterprises to stable norms of the formation of the wage fund and profit distribution which would make it possible for them to plan confidently long-term prospects of their development; thirdly, the formation of competitive relations in the spheres of production and NIOKR [scientific-research and experimental-design work], ensuring for the clients ordering new equipment not only the right, but also a real possibility of selecting its developer and supplier.

Quite often the opinion is expressed that expenses on the development on fundamentally new NTP directions should be financed from centralized sources, and expenses on reequipment based on traditional technologies should be financed from funds for the development of production of science and technology. In our opinion, this approach cannot be universal. When the latest technical principles or ideas promise a relatively rapid effect, it is possible to finance their realization fully or partially on the economic accountability [khozraschet] principles. On the other hand, those enterprises whose low technical level formed due to long-term removal of profits to centralized funds must in some cases receive the necessary funds from the state for their reequipment. Such subsidies are, evidently, necessary during the transitional period, although the principle of self-financing will later be implemented more and more consistently.

There is no doubt that self-financed enterprises will be investing funds in promising equipment only when they will be fully confident that, by the time it becomes profitable, its main part (with the exception of deductions to the state at stable tax rates or norms) will remain in the possession of the production unit. Moreover, it is impossible to have adequate profits by any other means.

Thus, it is not the precriptive methods, but the economic conditions (threat of lagging, losses of profits or possibility of losses) that will compel enterprises to use part of their present income on solving promising problems. However, since such conditions and economic consciousness corresponding to them form gradually, for a few years it is necessary to influence the process of the development and introduction of new equipment by issuing state orders profitable to their executors and granting state subsidies and credits, including those from risk funds.

Footnotes

1. In 1986, there were 2649 NII in the USSR with 551 branches and departments. Most of them were industrial NII.

2. See PLANOVOYE KHOZYAYSTVO [Planned Economy], 1986, No 6, p 36].

3. For example, see PLANOVOYE KHOZYAYSTVO, 1987, No 3, pp 64-68.

4. See VESTNIK AKADEMII NAUK SSSR [Herald of the USSR Academy of Sciences], 1986, No 1, p 16.

5. See Academician B. Ye. Paton's speech at the general meeting of the USSR Academy of Sciences. VESTNIK AKADEMII NAUK SSSR, 1986, No 5, p 49.

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Marchuk Interview on Democratization, Independence

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[Interview by Aleksandr Nemov with G.I. Marchuk, president, USSR Academy of Sciences: "Towards the 19th Party Conference:" "Breakthrough Strategy." Passages in boldface as published]

[Text] **Guriy Ivanovich, the experience of the first 3 years of restructuring has shown with particular clarity that a revolutionary leap is impossible without science. The economy will not be brought to new limits without advanced technologies in the fields of microelectronics, instrument building, information science, biotechnology and the creation of materials with previously assigned properties. This is noted in the CPSU Central Committee Theses for the 19th All-Union Party Conference. Furthermore, one cannot help but note that meanwhile important changes in scientific and technical progress have not occurred. As before, many new technologies come to us from abroad. Some Western economists are predicting that in the next 20-30 years the USSR will thus be unable to catch up to leading countries. What would you say about such predictions?**

Their lack of objectivity can be easily shown. In certain areas of scientific research not only do we not need to catch up with anyone, but, on the contrary, we act as "trend setters." Last December, for instance, a space flight was completed in which Yuriy Romanenko set a record for a man living in space—326 days. Today, the fact that our scientists know how to effectively struggle against weightlessness is acknowledged throughout the world. For precisely this reason, many American astronautics specialists believe that they should mandatorily cooperate with the Soviet Union in preparation for a Mars flight. After all, such a flight would last about 2 years.

The observation results from the explosion of a supernova star in the Great Magellan Cloud, obtained using the "Roentgen" observatory installed in the Soviet orbital "Mir"-"Kvant" complex, has sparked great interest among the scientists of different countries. The launch of the Soviet "Energiya" carrier rocket, capable of putting 100 tons of payload into orbit, is a significant step forward.

We also have many successes in other areas, besides space research, although it must be acknowledged that there are also reverse examples. Consider, for example, medicine and biology. Recently, the Academy of Sciences jointly with the Academy of Medical Sciences, as well as a number of ministries and departments, examined the situation with the development of new medicinal preparations. Thousands of people are suffering because of the lack of needed medicines. How could such a critical situation have formed? There are, of course, objective reasons: the medical and microbiological industries lack the adequate production capacities and necessary equipment. However, this is only part of the story. The more bitter truth lies in the fact that there is an entire series of preparations which we are currently in no condition to produce. The biological activity of many compounds has not been studied and technologies for producing them have not been developed. Consider the laboratories of some of our institutes—they have no equipment enabling them to conduct research at the molecular level. Yet this approach is basic in modern medicine and biology.

Then, at a joint meeting of the two academies, specific measures for changing the present situation were outlined. However, before undertaking the drafted program of action, they tried to look into why Soviet science has lost its leading position in these areas. The scientists who spoke at the meeting painted the model of this lag differently, but they did agree on one thing—the administration's endeavors in science and in the economy in the 1930s-1940s and even later, in the 1950s, the conversion of scientific into political discussions, and a withdrawal from proof obtained as a result of research in favor of the arguments in documents imposed from above, had extremely negative effects on scientific exploration. After the sadly infamous VASKhNIL session of 1948, institutes and laboratories working in the field of classical genetics were closed, in both the the Agricultural Academy, as well as the USSR Academy of Sciences. The world-renowned school of Soviet geneticists virtually ceased to exist. At that time the assault on the living cell was being actively carried out in Western countries. The discovery of DNA occurred shortly thereafter.

Another scientific field—cybernetics—shared this ill fate. The first Soviet computers were not only not inferior to American hardware, but even surpassed it in some parameters. The basic principles for powerful computers had actually been developed by Academician S.A. Lebedev by the end of the 1940s. The slogan "cybernetics is a bourgeois pseudo-science" put a damper on work by Soviet scientists.

It was precisely then that the lag in an entire range of scientific research was started which has now turned into a lack of the necessary electronic instruments, sensitive measuring devices and computers. Almost any complicated modern experiment is inconceivable without mathematical modeling, data processing, i.e., the extensive use of computer equipment. However, we cannot boast that every scientific worker in the academy has a computer display on his desk. Today a great deal of work is being done to make up for this neglect. Within the framework of a specially created department of the USSR Academy of Sciences, several large institutes are working in the field of information science and computer hardware. Last year, for example, two supercomputers with an operating speed of over 100 million operations, created by Kiev and Leningrad scientists, underwent state tests. The series production of Soviet personal computers has been started.

However, one should not think that we must learn lessons from the past only to correct the state of affairs in genetics or cybernetics. Despite their significance, these are only individual problems. All Soviet science, particularly basic science, needs renovation. At the Academy of Sciences general meeting ideas for its restructuring were drafted. Today, we can better see the path which we must take. I would single out two main goals. These are the expansion of democracy in the work of all of the academy's elements, from the presidium to the laboratories, and the search for new forms for organizing scientific research and more fully meeting the needs of restructuring in the economy.

Why do I single out the need for democratization? Precisely it will enable us to avoid the distortions of 40 years ago, when only one viewpoint had the right to exist. Science needs the struggle of ideas, opinions and approaches.

We concluded that it is time to eliminate the faulty practice of directly financing academy institutes and laboratories. This leads to stagnation in science and the creation of scientific groups which make claims to a monopolistic position in their own fields of research. The spirit of contemporary science itself requires the scientists' creative activeness, or if you wish—a desire to shake the world. This can only give us competitiveness. Specific problems will now be financed, and that institute or laboratory whose proposed research program is the best will engage in solving them.

For instance, a series of work in the field of high-temperature superconductivity could be considered the greatest scientific event of the last year. Scientists in the USSR, the United States and other countries have shown that at temperatures of about 90 degrees Kelvin (-183 degrees Celsius) it is possible to force certain materials to become ideal conductors, i.e., to transmit electrical energy without loss. Considering that almost a third of all conducted electricity in the country is lost precisely in transmission, it is understandable how great the significance of this work is.

In the Soviet Union high temperature superconductivity was obtained immediately in several institutes. Therefore, the question arose of which scientific collective to give preference to in further studies, which will most likely require substantial additional grants. Then a contest was announced for the best work program. Great scientists were included in the expert commission. The results were summed up at the beginning of this year. I note that among the winners there are scientists from Leningrad, Siberia, Lithuania and other areas of the country, i.e., success in the contest is not guaranteed to an institute in the capital. The important thing is the quality of the ideas.

I particularly wish to discuss the creation of a system of commissions of experts in the Academy of Sciences. For a long time, very little attention has been devoted to this. Expert work was almost a social burden. It is necessary to become convinced of the fruitlessness of a project at the beginning stage of research, not after its implementation. However, the expert approach, in addition, also contributes to the expansion of the independence of scientific collectives. As I already stated, there will now be financing not of institutes, but of problems. This means that laboratories and scientific groups themselves can develop and work out research programs and prove their priority nature. If their high scientific level can be established, budget financing is guaranteed. Those collectives which did not pass the "contest" should win a new scientific competition in order to earn their "living." If a certain collective turns out to have neither scientific ideas nor knowledge of how to solve practical problems, it will be forced to admit that it should not take exist as a separate institute or laboratory.

Expanding the independence of scientific groups has made it necessary to reject the academy's excessive centralization. Unfortunately, for a long time the practice has existed in which even insignificant matters—a business trip abroad for a scientist, the acquisition of equipment, publication of books—have been submitted to a presidium meeting. This has prevented scientific personnel from focusing on the solution of truly large, long-term problems. A significant part of the academy's leadership functions have now been transferred to departments, where the greatest scientists in one or another area of knowledge work. The departments themselves determine the main lines of research, perform expert examinations of work, and can redistribute resources as needed to strengthen a certain area and solve cadre problems.

The expansion of the independence of collectives is directly related to their right to elect their own leader. Today this element of democratization is entering our life everywhere. What is the state of elections in science?

Electivity was included in the rules of the Academy of Sciences itself. Academy members, corresponding

members and institute directors are elected by secret voting. Today we are also extending this rule to the heads of laboratories and scientific research institute departments. Of late, many debates are arising on the subject of how to hold elections. Thousands of suggestions have been studied, the most expedient of which have been approved by a general meeting of the USSR Academy of Sciences.

Let us consider the main link of science—the laboratory, sector and department. Today, the leaders themselves promote scientific employees. The academic council of an institute listens to the policy speeches of the nominated candidates and through a secret vote decides which one of them will run the subdivisions. Someone may object—after all, the scientific council, which is appointed by the director, has the last word all the same. I would like to make a correction here: the institute council is not appointed now, but elected through secret voting by all of the scientific employees. Thus, the collective's rights are not infringed upon. Moreover, the new status of the academic council makes it independent of the institute leadership and its voice is becoming decisive.

Emotions are seething around the election of scientific research institute directors. There are changes here as well. Candidates for this post can be nominated by the scientific collectives, departments or scientists of the Academy of Sciences. Whereas previously this question was immediately submitted to the department for voting, the candidates are now obliged to first obtain a "vote of confidence" through secret voting in the institute collective. It is precisely there that their research ideas and scientific programs undergo the first expert examination. The second examination is the secret vote in the Academy of Sciences department. As elections of directors in more than 100 academy institutes has shown, the opinions of the collective and the department have almost always coincided. The new leaders received the majority of votes. However, there were also exceptions.

For instance, several candidates "fought" for the director's position in one of the Moscow institutes. The collective preferred an academician. His rival, a USSR Academy of Sciences corresponding member, received slightly fewer votes. However, the secret vote in the department showed that the majority of scientists favored the program for restructuring the institute's research, proposed by the corresponding member. He became director. Can it be said that the elections were undemocratic? I do not think so. After all, the collective, by giving each scientist more than half of the votes, delivered a unique "vote of confidence." As far as elections in the department are concerned, as I already stated, its members are the most outstanding scientists in a certain field and, most likely, they can see the prospects for research without bias and more profoundly than a laboratory worker or a senior scientific associate could.

The role of the individual in science is improbably large. Let me cite the following example. I already said that difficult times occurred for Soviet genetics in the late 1940s. However, how did its rebirth begin? Genetics and molecular biology laboratories began to be created in the institutes, which conducted research in quite different fields—nuclear physics and chemistry. M.V. Keldysh, I.V. Kurchatov, N.N. Semenov, A.N. Nesmeyanov, V.A. Engelgardt, P.L. Kapitsa and M.A. Lavrentyev did everything they could so that this long-term scientific trend would be actively developed. There are also many other examples in which great scientists have made principle-minded decisions which played a significant role in Soviet science later on.

The last election to the academy took place according to the new formula. The election procedure became more open. The candidates were discussed in scientific collectives and departments of the USSR Academy of Sciences. There were suggestions on acquainting the broad public with the participants, for instance, publishing lists of them not only in the VESTNIK AN SSSR, but also in the central press. We are mandatorily taking this suggestion into consideration.

Last December the academy ranks were immediately replenished by 83 new academicians and 172 corresponding members. Why? According to the new regulation an academician who has reached 75 years of age becomes, as it were, an honorary academician (with preservation of all the rights of an academy member), and a new researcher is promoted in his place. Age restrictions have also been introduced for the positions of head of an institute or laboratory. Life itself has dictated these measures. For instance, before the last elections, of almost 300 academicians, only a third were younger than 65. This cannot help but influence the effectiveness of academy work.

An interesting thing: even in 1962 a resolution was passed according to which scientific and organizational positions could no be held by scientists over the age of 65, except for special exceptions. However, apparently, there were too many exceptions. Out of 250 institute directors, 60 had passed the age limit. It is no accident that I am talking about this so much. The problem of the influx of new forces into the academy and the involvement of talented young scientists in the institutes is urgent today, as never before. The average age of scientific employees in the USSR Academy of Sciences is 45 years, although in 1955 it was 33.4. I think that everyone knows that scientists accomplish the majority of discoveries precisely in their younger years.

The USSR Academy of Sciences Presidium has analyzed the work of leading institutes which set the tone for world research and has made a decision to apply their approaches to the entire academy. Possibly, the adopted decisions will not seem indisputable to everyone, but the fact that they will influence the intensification of scientific work causes no doubts in the USSR Academy of Sciences.

In order to continuously renew cadres the institutes are now obliged annually to hire young scientists. If one takes into consideration the tempestuous development of the Ural and Far Eastern Departments, on the average no less than 3 percent of the overall number of employees should be replenished by young people. Thus, in about 20 years the entire staff of a scientific research institute will have been renovated.

Logic (and experience) implies that 15 percent of the existing laboratories in institutes should be closed within 5 years, in order to make it possible to create new ones which will conduct more topical research.

Perhaps, the most important thing is that in the structure of the scientific research institute, temporary laboratories and departments are now being legally reinforced. They are being created to deal with a specific problem: as soon as the collective solves it, the subdivision ceases to exist. The employees of such temporary groups work on contract. This makes it possible to involve the most gifted scientists in research. In the presidium's opinion, in academy institutes a third of the employees should work precisely in temporary collectives by 1990. Such an approach will surely contribute to the acceleration of research and the creation of healthy competition.

Guriy Ivanovich, you have dealt with many aspects of acceleration of research in the academy. However, you must be aware of the fact that fewer scientists work in academy science, which develops truly innovative technology, than in sectorial scientific research institutes by a factor of 20-25. The correlation of allocated funds and resources is approximately equal. How can the influence of the USSR Academy of Sciences on scientific and technical progress in the country be expanded in spite of this?

This is probably one of the most "painful" problems. Industry has functioned too long under the conditions of administrative-command management methods, when the principle of "the gross at any price" blocked all new ideas and developments. Enterprises pursued obsolete production, in no way concerned about its modernization. Why not? After all, they did not have to think about the market. Sectorial science, which had virtually ceased to be "nourished" by the academy's ideas, was also degraded to a considerable extent under these conditions. We arrived at a situation in which many progressive technologies (sometimes even inaccessible to leading Western companies) existed only on paper. Cost-accounting and self-financing not only of enterprises, but also of sectorial scientific research institutes, of course, brings everything "from the head to the feet." Applied scientists are beginning to work more effectively, and scientific exploration will stimulate industry. However, as the first 3 years of restructuring indicate, large-scale changes will not occur quickly. We should be prepared for this. Here, it seems to me, it would be expedient to utilize experience which is already available.

In my day, I managed to be a participant in the "atomic program." I worked in Obninsk and dealt with the design of the first Soviet nuclear reactors and the creation of atomic power plants. This was an assault upon the truly unknown. Often, that which the scientists had on paper in the evening had already been created in "metal" and had undergone experimental testing by morning. All of the installations were created in the shortest time period. Although dozens of scientific collectives and hundreds of plants from various sectors were involved, there was no interdepartmental confusion whatsoever. The efforts of thousands of people were coordinated by an administrative agency under the USSR Council of Ministers. And, as everyone knows, we became leaders in the nuclear industry.

The key problems of restructuring the economy, in particular, how to improve the work of centralized headquarters—the Council of Ministers, Gosplan and the ministries—will be discussed at the party conference. However, after all, today we have problems no less significant than the atomic problem, which should also receive the attention of these agencies. Of course, this includes computer equipment and biotechnology. I have already talked about this. I will name two more large-scale tasks. The first is the creation of composite materials. I recently met with the leaders of several machine building plants and was amazed by the fact that even they do not imagine all the possibilities of composites. Yet, after all, precisely these materials promise a genuine breakthrough in machine building. Machines and equipment created on their basis are 20-30 percent lighter and last several times longer. Moreover, the energy-intensiveness of producing them is reduced by a factor of 8-10! Materials have already been made which are lighter than aluminum but sturdier than steel. In many countries an actual "age of composites" has started. They are building automobiles and erecting buildings out of them. This is understandable: composite materials do not suffer from corrosion, losses from which alone consist of billions of rubles annually in our country.

The use of these composites in the Soviet Union is extremely limited. Perhaps only the aviation industry has serious demands. The giant transport airplane "Ruslan" was built using the new materials, and they will be even more broadly used in the Il-96, the Tu-204 and the KB helicopter imeni N. Kamov. A state program for new materials would make it possible to utilize the academy's scientific potential in this field significantly more effectively.

Another problem which has recently received particular publicity is the defense of the surrounding environment. Today, civilization's achievements could easily become its shortcomings. The ecological situation in a number of the country's cities—the industrial centers of Kemerovo, Salavat, and Ufa, where gaseous emissions exceed permissible norms, and the tragic events at the Chernobyl nuclear plant attest to this. The obvious conclusion is to require careful expert examination of each project, plan, standard

or instruction. Probability forecasts are needed for the development of enterprises, regions and the entire country on the whole. This is a serious scientific task.

A different task faces science in ecology. "Dirty" technologies should be replaced by clean ones. This does not only concern the chemical, petroleum and gas industry and ferrous metallurgy. For instance, the influence on nature and man of automobile emissions causes great alarm today. This is the scourge not only of large cities, but also of small settlements. The losses amount to hundreds of millions of rubles annually. Forecasts for the future are even less comforting. Throughout the world an active struggle to reduce harmful emissions is being carried out. Devices have been created, for example, which reduce the emission of harmful gases by a factor of 8-10. Virtually all automotive companies are converting to the production of such automobiles. Moreover, some countries have even passed special laws prohibiting the use of vehicles without them. In order not to lose exports, VAZ, for example, will purchase and install these devices on automobiles being sent abroad. However, after all, we ought to think about our own nature and people first.

I have listed a number of big problems which demand particular attention. How can a breakthrough be achieved in other areas? We must more actively master new forms of interaction between the country's leading scientific centers and industry. Today, more than 20 intersectorial scientific and technical complexes (MNTK) have been organized. Some of them—the Electrical Welding Institute imeni Ye.O. Paton and "Katalizator"—have already achieved significant results. Work is also actively being done in "Rotor," "Nadezhnosti Mashin," "Biogen". But nevertheless, we expect far more from the MNTK.

Why does failure occur? A complex, after combining scientists, designers and production workers, i.e., the representatives of different departments, essentially has not managed to conquer their departmentalism. As before, each of the partners must report to his own ministry and lives a detached life. The MNTK has many unresolved problems concerning its economic, administrative and legal status. On the one hand, they created the MNTK, on the other, they restricted its independence. More profound cooperation on an interdepartmental basis between the scientific research institutes and the enterprises involved in the complex is needed. Practice leads us to this conclusion. The problem of independence seems to be one of the key issues in scientific and technical progress. Today, it is difficult to predict what kind of new organizational forms are needed in order to intensify scientific research. Life outstrips the boldest prognoses. Cost-accounting centers for scientific and technical services and intellectual cooperatives are already being created. It is important to note all that is new and progressive at the right time, to support it and to give full range to initiative.

A tempestuous time is beginning for science. However, without this a breakthrough in the future is impossible.

13362

Gleba Interview on State of Soviet Science

18140310b Moscow IZVESTIYA in Russian
24 May 88 p 3

[Interview by Ye. Manucharova, with Academician Yu. Gleba, under the rubric: "Nineteenth Party Conference: Tasks of Restructuring:" "Priority—To Talent." Passages in boldface as published]

[Text] Gleba is a young man. Therefore his name, although well-known in scientific circles, is still new to the broad reader. The field which he researches is also young: genetic engineering. The practical application of his work is the rapid creation of fundamentally new types of plants with properties especially needed by people.

At the recently held general meeting of the UkSSR Academy of Sciences, of which he was made a member, Gleba sharply criticized the organization of science in our country. Boris Yevgenyevich Paton, president, UkSSR Academy of Sciences, advised me to speak precisely to Gleba, as "a man with independent convictions and interest in scientific ideas."

Yu. Gleba heads a large department in the UkSSR Academy of Sciences Institute of Botany. The average age of his coworkers is less than 30. The academician himself is under the age of 40.

Yuriy Yuriyevich! You are the youngest academician in the UkSSR Academy of Sciences, and therefore it would be particularly interesting to know on what principles the work of your department is structured?

In my opinion, these principles are called democracy. All employees are initially equal in terms of rights. Everyone is potentially talented...

Each chooses a main theme for himself: we jointly discuss it in a seminar and accept ideas based on competition. Each person becomes the "number one person" in his own subject area: he heads this line of research and is responsible for it.

In a different kind of problem, naturally, each (along with another person) also acquires the role of assistant. Specialists in genetics, physiology, molecular biology, etc., complement each other. A master, of course, can have a student.

However, this is not an assistant. In my opinion, it is more interesting to work without laboratory assistants, without people with lesser rights and responsibilities. It is more interesting and more profitable to take only skilled and strong people on staff. Half of our people are candidates of science, and many have worked in Belgium, the FRG,

Hungary, and the GDR. We have all worked for a while in the best laboratories of the country. If someone cannot handle the strenuous load typical of the department, we do not drive him away, but we also do not hold onto him. As a rule, the person leaves on his own. This is not his place, not his level. It may sometimes seem to someone that the research on a problem in which he is not the main person has been set up incorrectly. He may propose his own, better variant. However, if one he not succeed in proving his own correctness, he then surrenders. Talent must be manifested and turn from a thing "in itself" into a talent serving us.

Such an organization has only two motivations: a sincere desire to work in science and human decency.

Understandably, this is "piece" work. The researcher's personality takes the center of attention. The results of this organization are already well-known: the country's first patents in the field of genetic engineering, the world's first monograph on somatic hybridization, published both here and abroad, and pioneering work in the genetic structure of plants. The pace of work set by the young department is very high. What, in your opinion, can accelerate the pace of the country's scientific organizations? What kind of system?

One that makes it possible to evaluate the individual person: the system of grants, which has been adopted throughout the world. Precisely it is aimed at facilitating the most difficult thing in the organization of science—finding talented people.

It has not been adopted in our country: you should explain what a grant is.

Of course: a grant is the allocation of funds for a specific task. Both state institutions and private individuals can offer grants. The entire allocated sum is indicated or just the upper and lower limits of those funds, which those competing for the grant can account for. Scientists write proposals, enumerate their previous successes and explain why they need some amount of money or other for the proposed task. The candidate, whose scientific abilities and technical equipment evoke the most confidence, wins the competition.

Do you propose organizing work in key and high-priority areas this way? Or in all science in general?

The concept "high-priority area," to speak truthfully about exploratory basic science, seems highly erroneous to me. By definition, tomorrow's truly new result bursts our present-day concepts, and attempts to predict it have never been particularly successful. We know nothing in the face of tomorrow and ought to display the proper modesty. Consider examples from biology. In the early 1970s, experiments in hybridization of somatic cells of animals, it seemed, were purely an academic part of study, and no one would have been so bold as to presume that in 10 years technologies on the basis of such hybrids (hybridizing equipment) would provide half of the multi-million dollar incomes in biotechnological industry.

Basic science is a risky undertaking which does not lend itself to the planning of results. Nowhere has there ever been or will be a waste-free science. Personally, the front should be as broad as possible.

Nevertheless, a policy and financing of basic research is necessary, if only because funds in science have always been limited and one must choose something. While risking seeming like an apologist for the Western organization of science, nevertheless I will state that I believe the most effective system is that adopted by the Max Planck society (FRG). The Society's highest priority has always been not a certain specific area, but a specific talented scientist. The basic task is that of equipping the most talented researchers and providing them with constant material support. A new Max Planck institute is always created for a specific gifted scientist, and when he leaves the institute ceases to exist.

I will state this again, in order to emphasize that science is a creative process and the lot of a gifted minority. Until we realize that science (just like art, agriculture and in the economy in general) is done by a specific person, our level will remain as before. In our present-day biological science (I suspect that biology in this sense is far from the exception) the state it is such that the absolute majority of new basic knowledge is achieved by our Western colleagues and not (unfortunately!) by us. Thus, our biology is not viable as a national science at this stage. I am referring to science as a self-sufficient, self-regulating and self-evaluating process.

We all know how seriously voluntarism has reflected precisely on biology. Readers, as I would imagine, familiar with the phenomenon of Lysenkoism and its consequences, have read about how talented people were tragically lost here. Let us return to the overall problems of organizing our present-day science.

It is my impression that we simply lack organization of science. In any industry, including the scientific industry (I am referring to the production of scientific knowledge), there are two definite parameters: quality and production cost. Any effective technology for scientific production should make it possible to evaluate the quality of labor and to control its orientation.

We are not raising the level of our own science, if we accept domestic evaluations. The quality of scientific, like any other, production is tested only against the best models in the international market. The most sober, albeit also most bitter evaluations are not state and departmental prizes or certificates of discoveries, but the citation indices and the quantity of publications in the best international journals.

One ought to think about why the Americans utilize the open press so well. Incidentally, it is easier to explain why we often do not do this. In order to send a manuscript of an article abroad, I must collect the signatures of dozens of people, not one of which knows the particulars of this field of science. Thus, why be surprised when they do not want to sign? However, this is only the half of it. Secrecy is most often the best way to hide poor quality work from the evaluation of one's colleagues. The flow of information to us (again I am speaking of biology) exceeds the thin trickle from us many times over.

Thus, I think that our sights are off target, that the scale and methods for evaluating a scientific commodity require serious correction.

There is no greater clarity in the problem of controlling the orientation of scientific labor, either. There is no effective procedure which makes it possible to encourage development in one or another direction. To put it roughly, as an organizer of the scientific process, I ought to know where to find the feeding trough, how much I can obtain from it, and how. However, in the academies there is no well-founded financial incentive. As a result, higher-ranking authorities pass resolutions and programs without considering the possibilities for material support, yet we are trying to be among those executors only where material support is possible.

Academician R. Sagdeyev pointed out the main problems of our science in his informative article "Where We Lost the Pace." I would like to say that the pace is also being lost through today's redundancy.

For example, I will name only the most important of those programs and other organizational innovations in which we are participating: Union and republic programs in biotechnology, the comprehensive NTP program for CEMA-member countries, the "Biogen" MNTK, bilateral cooperation with institutes in the FRG, Belgium, Hungary, etc.—23 in all. However, only participation in the "Biotekhnologiya" program with fair certainty entails material wealth in the form of foreign currency and state units. And that is it... What is this desire to buy something for one and the same ruble not just once, but five or 10 times? Consciousness all the same will be determined precisely by this one ruble, and not by the five programs.

I do not at all want my conclusions to sound like revolutionary appeals to abolish all programs and scientific councils as unnecessary. A mature infrastructure for scientific production will invariably be complex and differentiated. However, on the basis of any new organization, expediency and effectiveness should underlie measures. Organizational outlays should pay for themselves.

How much of your time do you spend on organizational fuss in the 23 programs that you do not always need?

So much that the party and state agencies would like it. Unfortunately, very often time and energy are spent here in a struggle against entropy, mainly for the sake of maintaining the "status" of all the regional structures.

Such surplus organization is absurd—it is the basic source of our psychological exhaustion and apathy. It often reminds me of a famous anecdote of the philosopher Albert Camus. A person with a fishing pole is sitting next to a bathtub full of water. Another person approaches, looks and looks, and then asks: "Well, are the fish biting?" To which the first responds: "You fool, can't you see that this is a bathtub?"

However, we are all wise after the fact, and our bravery almost always occurs after the battle. Therefore, it should be said that the bad habits which are being discussed have not been overcome—as before, the raykoms and gorkoms are interfering in the organization of science and are even deciding the fates of scientific leaders in the academy. IZVESTIYA wrote about the methods they are using to assign mathematicians to the fields of a self-financing (!) sovkhoz. To use scientists this way is the same as hammering nails with a microscope. Although, thankfully, this time it is in spite of party Central Committee lines.

Today, most of all we are spilling blood on fruitless conferences, endless going appearances with reports and mind-bending searches for solutions to almost insoluble organizational problems.

I realize that trust in scientists, to a significant extent, has been undermined. However, trust in everyone responsible to the people for the country's fate has been undermined, above all, trust in the leading (including in the party) elite.

However, nevertheless we cannot budge without trust. I trust a party or state worker as far as managing the country is concerned, but they should be so kind as to trust me in science and respect my opinion. I think that the party conference should clearly define the limits of the powers of an agency. Each should stick to its own job.

History has shown how harmful the suffocating guardianship displayed by party organizations is for science. In the first place, this concerns the social sciences, but the representatives of the precise sciences, genetics, cybernetics, machine building, etc., etc., could also say much that would be instructive on this subject. The leaders were convinced that they knew the real truth, like some sort of meta-science. Under the country's specific conditions this version of "true knowledge" turned out to be omnipotent—with all of its ensuing consequences for those who think otherwise.

Yuriy Yuriyevich! Is today's academy is not satisfying scientists only because of the many difficulties in its past? Has this deformed and weakened it? Is this the only cause of today's troubles?

One should not see the academy as a particularly distorted structure. It has been deformed as much as all other cells of society. (Perhaps, even less: true scientists work according to internal motivations and often rather in spite of the departments). To paraphrase an English saying: we have that academy, which we deserve.

However, it is not that which we would like. If we analyze the causes of this situation, two main factors must be singled out. I have already mentioned one of them—guardianship. The other is the growing role of science in society, which we have not always understood quite correctly.

Scientific production has been converted into a powerful industry and an inevitable contradiction has arisen between the individual nature of the scientist's creative labor and the need to plan labor organization for large "armies" of scientific workers. The role of the "generals"—the organizers of science—has grown excessively. At some moment, a tendency appeared among them to equalize the personalities of the thousands of people under their leadership and, in addition, to overestimate their own present-day contribution (in Russia this work has always required high art).

However, any social organization has a tendency to expand and multiply: like engenders like. For example: the mafia is trying to control ever-greater territories and numbers of sectors, yet its staff is being filled by people who only sufficiently resemble the "cadre" mafiosi. Similarly, for instance, Minvodkhoz is striving to expand land reclamation and increase its own budget.

Academicians are selecting those like themselves in secret voting.

An important guarantee for the academy's healthy development is a good "heritage," a good initial structure.

However, when the academy consists primarily of managers or "people-leaders" it recruits primarily organizers into its ranks, and not scientists...

History has shown what terrible consequences the forcible "dilution" of scientists in the academy by way of "appointment as an academician" can also have for science: VASKhNIL was subjected to precisely such an operation in 1948.

Afraid to repeat the terrible past, the academy is now often making hasty cosmetic steps to democratize science. I do not think that I am fond of yesterday's authoritarian regime. However, the newly remodeled stereotypes also sicken me. For science's sake, we must walk the entire path: from a dictatorship of power to democracy, and then further—to a dictatorship of talent. As Plato said: one should not use voting in places where simple knowledge is sufficient. However, something else is also true—there should not be voting, if voters have no knowledge in general. For me, at least, it is not obvious that a laboratory technician should elect the leader of a scientific area and, moreover, that democracy lies in this.

We wish to get rid of old organizational stereotypes. Restructuring means taking things apart and then building them anew. Since we have only one life to do all of this, we should be interested in building not only somewhat more quickly, but also somewhat better.

13362

Shortcomings of Republic MNTK's, Cooperatives

18140317 Vilnius SOVETSKAYA LATVIYA in Russian 15 Jun 88 p 2

[Article by E. Yakubaytis, vice president, LaSSR Academy of Sciences: "Time To Decide and To Act"]

[Text] The CPSU Central Committee Theses for the 19th All-Union Party Conference consider the acceleration of scientific and technical progress the basis of the party's economic and social strategy. In many ways, this formulation of the question obligates scientific institutions and their labor collectives.

The grandiose process of restructuring the entire national economy is taking place in the country, the basic goal of which to ensure a transition from administrative to economic management methods. Naturally, the search for new forms of science-industry interaction has decisive significance in this great matter, important to the state's destiny.

Scientific developments are often not utilized in practice, which leads to a serious lag in the national economy and is reflected in the people's standard of living. There is another aspect to the problem as well: industry's sluggishness toward science can hinder the research intensity of science. Thus, a vicious circle is created which, if unbroken, makes it impossible to raise the national economy to a high level of effectiveness.

Unfortunately, there are many reasons leading to this stagnation. I would like to single out one of them in particular. This is the weakness of the experimental base for scientific institutions. The CPSU Central Committee Theses for the 19th All-Union Party Conference directly indicate that science's material base continues to lag.

The national economy can be compared to a large branched tree. The diversity, number and quality of its fruits depend not only on the tree's branches—industrial enterprises, transportation and agriculture, but also on the roots which feed them. These roots are science and its work. The roots are not visible: they are underground. Thus, when we want to obtain a large crop, we often try to do everything possible to strengthen the branches, frequently forgetting about the roots which, in economic terms, are not receiving the necessary resources and possibilities.

So it is that the experimental base of most scientific institutes of the Latvian SSR Academy of Sciences still remains very weak and does not correspond at all to contemporary requirements for technical progress. The most important condition for intensifying scientific research and creating new instruments, devices and progressive processes is the strengthening of this base and the creation of design bureaus and experimental production. How and in what way should this pressing task be solved?

Economists have already proven how effective small enterprises can be under contemporary conditions, particularly science-intensive production specializing in computer equipment, microelectronics, robotics, etc. It is precisely these which are capable of easily comprehending new ideas, quickly restructuring production and ensuring the output of complex modern items.

Small industries also make it possible to organize the continuous "research—design—experimental and small-series manufacturing" process very effectively. This process can be organized in different ways, including the creation of republic inter-sectorial scientific and technical complexes (RMNTK). This method is already being used in our republic and has yielded definite results. However, the RMNTK do not fully warrant the hopes placed upon them, for which there are several reasons.

These inter-sectorial complexes were created before resolutions were passed on converting from administrative to economic methods of national economic management. Therefore, the list of enterprises included in RMNTK was drawn up using the directive method, as a result of which some of the enterprises have not been participating at all in the work of the complexes, while the remaining operate very passively, pleading the new cost-accounting conditions.

Furthermore, in the resolution on RMNTK it was written that they were intended for conducting research and development right up to creating experimental prototypes of new equipment and technology. However, prototypes require subsequent series production and not a single republic enterprise is doing this. After all, that proposed by science is the latest production, requiring the development and mastery of complex technology.

The time is ripe for restructuring the work methods of existing RMNTK, for converting them into scientific production associations which have small enterprises capable of small-series production of the latest devices and instruments. Today, all of this has become an obvious and urgent matter. Such dynamic enterprises would be able to fully provide for the republic's needs for a broad range of items. These small enterprises could be formed either by reorganizing existing industries, or by creating new ones.

A "economic niche" has formed in the republic, related to the lack of small enterprises producing science-intensive products. This niche ought to be sensibly filled, proceeding from state interests. Otherwise, deformed solutions to the problems could appear. Unfortunately, such examples already exist. There are cooperatives which have neither a technical nor an industrial base, yet quite "magically" produce small sets of instruments and various types of equipment. Just like a fairy tale, their various electronic devices arise "from nothing" and have a magically high price. Yet the press, radio and television are delighted by these tricks and the extraordinarily large profits from them.

No one opposes cooperatives. It is also completely natural that small science-intensive enterprises could be both a state, as well as a cooperative enterprise. It should be taken into consideration that for the time being the granting of rights, necessary for efficient work by enterprises created along cooperative lines, significantly outstrips the possibilities of state enterprises.

The role of international cooperation in our economy is growing, which makes it possible to utilize foreign experience and to provide an outlet for scientists into the foreign markets. Along with contracts, a new form of cooperation, the creation of joint enterprises, is being used ever more extensively. Here is one example. Jointly with French and Norwegian companies, the LaSSR Academy of Sciences and the USSR Ministry of the Maritime Fleet are creating an enterprise to produce local information networks on the basis of professional personal computers. This enterprise, having utilized the scientific surplus of our Institute of Electronics and Computer Equipment, will produce equipment which will enable the automation of information processing in enterprises, scientific institutes, educational institutions, design bureaus and establishments. Each local network would replace a large and very expensive electronic machine. In this regard, the network will function reliably, yet its use will require a minimal number of personnel. The cost of the necessary electronic equipment is reduced almost by a factor of 10 when such a network is used.

The integration of joint enterprises into scientific production associations will complete the creation of the complexes of scientific institutions, design bureaus and small enterprises. This will make it possible to solve the problem of most effectively organizing the research, design and production processes.

Today, the problems of reorganizing science are topical. Accelerating the pace of scientific and technical progress in Latvia's national economy directly depends on what decisions will be made and what assistance the Academy of Sciences will offer in creating an experimental base and small-series production.

13362

Academy of Sciences Criticized for Inability to Compete With West

18140307 Moscow SOVETSKAYA KULTURA in Russian 28 May 88 p 7

[Article by V. Goldanskiy, academician: "The Art of Developing Science." Passages in boldface as published]

[Text] **The second half of the 20th century has been marked by a conversion from a production and technological to a scientific and information society. This is already obvious in such countries as Japan and the United States. This means that in the final account the highest labor productivity will be achieved precisely where they succeed in creating the most effective system of education and providing for the optimal development of basic science.**

In connection with this, both the condition of higher education in the country, as well as our share of the achievements in the area of basic science, evoke serious alarm. Unfortunately, the lag behind progressive countries is obvious here, and this gap is becoming wider. Our advantages—where they still exist—are gradually being eroded.

A simple example: the granting of high international awards for achievements in the natural sciences—the Nobel Prizes. We will not compare the absolute number of such prizes won in the post-war period by Soviet scientists (six) and American scientists (over 60). The fact is that the more powerful pressure of Americans on the Nobel Committee has a strong influence here. It is another fact which is alarming—of the six Soviet prizes, five were awarded for pre-war work and the sixth was for work done in the early 1950s. Of course, later on we did have Nobel-class works, but there turned out to be far more of them abroad (in the United States, England, FRG, France, etc.) in the 1960s-1980s.

The state of affairs in our science in the 1960s-1980s has reflected the "stagnant" situation in society. How, for example, has large-scale basic scientific research been financed? Priorities have often been determined not by the genuine significance of one or another gigantic installation or one or another research area, but by the striving to achieve record (more accurately, pseudo-record) indicators in a short time period. Science was used for propaganda, to demonstrate the supremacy allegedly achieved over the West—not only where such supremacy really existed, but also where it had never been acknowledged by any serious scientist in the world. Hence, there are areas closed to criticism and objective evaluation and fruitless expenditures of enormous funds and the best human resources.

For many years we have lived according to a self-hypnosis principle: "Close your eyes and constantly repeat: 'I feel good, I feel warm'—and you will start to feel good and warm." Only over the last 3 years have we finally decided to open our eyes wide and soberly look at the state of affairs in the country and in the world, but to this day many dogmatists cannot and even do not want to give up the habit of constantly keeping their eyes tightly shut.

In his day, A.N. Nesmeyanov, academician, president of the USSR Academy of Sciences, compared the development of science to a street battle for possession of a building. First, there is a breakthrough on to a new floor, then we spread out along that floor. The upward breakthroughs are the main tasks and events of basic science. As a rule, they are unpredictable. However, it is precisely they which entail genuinely revolutionary achievements not only in the area of the breakthrough itself, but also in many adjoining sciences, in their practical applications and in the scientific outlook itself. Work to introduce the results of new discoveries and to assimilate them technically are typical examples of "spreading out along the floor."

Thus, the lion's share of our scientific organizational activities in the post-war years (including remarkable achievements, such as the mastery of atomic energy and the breakthrough into space) were focused on tasks of "spreading out along the floor." The "breakthroughs to a new floor" in general gradually ceased to be considered by the USSR Academy of Sciences as the subject of its basic concern (perhaps, precisely because they are impossible to plan!). Scientific discoveries became almost unheard of at USSR Academy of Sciences meetings (except for the so-called "diploma'd discoveries," which we have registered by the hundreds, as has no other country in the world, according to the Goskomizobreteniye line, but these do not to the slightest extent determine international scientific progress).

The USSR Academy of Sciences had been unable to ensure leading development of basic research, and serious confusion arose in determining and assigning the roles and responsibilities of the academy and the departmental ministries in scientific and technical progress. As a result, it became generally unclear who is responsible for the next breakthrough in the first place

In speaking of the condition of the development of basic sciences, we have stressed the natural sciences. However, one could speak to an even greater extent of the impoverished condition in our social sciences. The administrative-command leadership and management methods and dogmatism have inflicted especially great damage precisely on the social sciences. History, economics, sociology, psychology, philosophy, and law—in general, the existence of all of these sciences could be mentioned by greatly stretching the interpretation. For instance, one of the basic tasks of philosophy, as everyone knows, is to interpret the achievements of the natural sciences and bring them to a social level. Here natural philosophy has already prevailed, the main purpose of which was to defame and reject everything new in natural science, to try to attach falsely understood concepts of dialectical materialism to nature (similar to the way in which falsely

understood, vulgarized concepts of historical materialism were attached to society). As a result, in the post-October period the scientists and humanitarians of capitalist countries have succeeded in achieving a great deal in comprehending the meaning of the laws of natural science and the nature of man himself. Our natural scientists and humanitarians in many ways have ceased to understand each other in general (let us recall attempts to eliminate genetics, cybernetics, quantum mechanics, the theory of relativity, etc.).

The struggle between conservatives and innovators, between the dogmatic and the creative, between the old and the new in science (particularly, perhaps, in the social sciences) is hardly any less sharp than it is in the creative unions. After all, even in science inertia, overcaution and the fear of losing obviously undeserved, monopolistic former privileges are often manifested quite clearly.

Whereas in the past the USSR Academy of Sciences was generally considered the most democratic institution, most independent of the bureaucracy, and had won legitimate respect for this, now, against a contrasting background of ever-increasing glasnost, the academy more often looks like a retrograde bureaucratic institution, somewhat reminiscent of a ministry of applied science.

Yet, after all, in the 1960s the academy made its first strike against Lysenkoism (which earned A.N. Nesmeyanov the president's chair) and in the 1970s it actively resisted in elections pressure from above, corruption and the automatic selection of high "ranks" (among those black-balled were heads of the CPSU Central Committee Science Department, ministers, judges from Vyshinskiy's "school" and philosophers who hardly deserved this title, etc.). The authority of the academy members' opinions at that time was determined primarily by their scientific value and actual merits, not by rank and position.

Today the situation is different.

A proper multi-level hierarchy arose at the head of the academy, hypertrophied in number, which is presently supported by a unique system of "differentiated democratization."

There are three levels in this "differentiated democratization."

The highest echelon of the academy is the president, the 10 (now temporarily nine) vice-presidents, the academician-secretaries of 19 departments according to specialization, and the presidium members—about 50 people in all. The age limit here is 75 years, but this only enters into effect in 1990, and only applies to the future staff of the presidium.

Elections to this higher echelon are held once every 5 years without competition, with one candidate per vacancy, while "rank-and-file" academicians essentially do not participate in nominating the candidates and usually only find out the names of these candidates at a department or academy meeting.

Thus, an entirely senseless and humiliating situation has formed which fully contradicts today's orientation towards democracy, glasnost and the socialist pluralism of opinions and in many respects turns the elections of the academy leadership into a fiction. Just think—after all, it is a question of electing the most worthy organizers and leaders of our science among all of 300 scientists who, according to academy rules, have enriched science with labor of first-rate scientific significance. How come it turns out that there is exactly one—no more, no less—candidate among all these "wise ones," worthy of deciding vital affairs in each area in the leadership of the academy itself? Why do academician-electors "from the threshold" refuse to judge who precisely among them can cope with these affairs more successfully than the others, but the understanding of this and the making of appropriate decisions is considered a priori the privilege and monopoly of the high leadership—the management staff of the academy should be determined by someone from above, not in the form of one or another alternative suggested to the academicians in the discussion and election, but as a single, pre-assigned variant.

Many of the academy's members remember how, 3 years ago, in elections to the USSR Academy of Sciences Presidium it was enough just to suggest one alternative candidate among the 50 candidates, to cause the author of this suggestion, a highly honored scientist, to be sharply rebuffed by the presidium.

In the last year or two the academy's leadership has passed a number of obviously useful measures to expand the rights of departments, aimed at granting them the functions of full-fledged masters of the institutes included in their structure.

Unfortunately, it did not get by without new bureaucratic inventions. In the USSR Academy of Sciences Presidium system new bureaucrats appeared, the unelected positions of "assistants" to the president and vice-presidents, which took the academy yet another step along tried and true ministerial paths: they erect yet another barrier between scientists who manage the academy and scientists who are academy members.

The senior administrative staff consists of the institute directors (several hundred people). The age limit is 70 years for academy members and 55 years for others. However, once again, the limit goes into effect from the moment authorities from the preceding election expired. Last year, after numerous press articles, the general meeting of the USSR Academy of Sciences passed a resolution to elect the directors through democratic methods with the participation of labor collectives. However, slightly later the USSR Academy of Sciences Presidium without prior permission abolished this competitive system for dozens of institutes, where new

directors were appointed on orders (which, incidentally, contradicts the rules, according to which institute directors are elected by the academy departments). The overall time period for the directors' authorities and the number of permissible 5-year "terms" are not restricted.

Somehow, a limitation on the overall length of the period of authority was introduced all the same, however, strange though it might seem, this occurred only for those positions unrelated to any sort of administrative powers whatsoever, for example, for the main editors of scientific journals and chairmen of scientific councils (which have consultation and advisory functions), etc.

On the eve of the 19th All-Union Party Conference measures were extensively discussed in the press, necessary for the further democratization of our state and party life. We must not fail to consider such measures in science more topical as well. Among them I see the following:

—the introduction of mandatory electivity on a competitive basis (with several candidates), a shift system (no more than two 5-year terms), the term of office for the highest management positions (president, vice-president, academician-secretaries, presidium members) and for the positions of institute directors in the USSR Academy of Sciences and sectorial and republic academies;

—it would be desirable to create a newspaper, SOVETSKAYA NAUKA, which would become an effective means for illuminating the role of science in the spiritual development of our society, an organ for the expression of social opinion on topical questions of scientific life and on its most vitally urgent thematic and organizational problems. The newspaper would be able to hold discussions on the role of Soviet science in restructuring and the democratization of our society, on the ecological aspects of science, on scientific ethics, etc. SOVETSKAYA NAUKA would also be able to publish materials concerning the activities of Soviet and foreign scientists in the struggle for peace, against the nuclear threat, and articles on history, including the history of science. The newspaper would become a true aid in involving scientists in active participation in restructuring and in its scientific and technical substantiation. It is particularly difficult to overestimate the possible significance of the appearance of a newspaper for Soviet scientists precisely in our time, when the mass information media have adopted the meaning of the steam-engine for the train of restructuring, driving this train towards our common goals and also signaling the dangers, when the old dogmas stand in the way and do not make haste to yield the road.

13362

Pay, Planning Flexibility Improves Performance of Research Collective

18140333a Vilnius SOVETSKAYA LITVA in Russian 20 Jul 88 p 2

[Interview of Algirdas Shileyka, director of Institute of Semiconductor Physics of the Lithuanian SSR Academy of Sciences, by L. Grinberg: "Not by Research Alone" in the column "The Questionnaire 'We and Perestroika'"; first paragraph is source explanation]

[Text] Algirdas Shileyka, director of the Institute of Semiconductor Physics, replies to the questionnaire's questions.

[Question] 1. What do you see lately that is new in the life of our collective?

[Answer] There are changes. Only recently in responding to this same question, I would have concentrated my attention on the directions and themes of scientific research. And it is unlikely that I would have been correctly understood had I unexpectedly started discussing the concerns of the men and their needs, at times the miserable conditions in which they are obliged to serve science. But if, God forbid, I would have talked about money—about that same pay, for example, or about the possibilities of awarding bonuses, in general about the ruble as an incentive for scientific-research work, then who knows, I might have driven readers into shock.

Formerly, the qualifications of personnel were denoted through the two official positions of junior and senior scientific associate. Difference in pay was significant. For those who succeeded in rising to the higher level (that is, minimally candidates of sciences), the salary guaranteed good material security. On the other hand, a junior scientific associate who is not a candidate of sciences could display marvelous working capability and inventiveness—nonetheless his work would have been rated not on the basis of actual results but according to his grade. Today it is not so. The number of categories has grown—there are now five. For each category a broad range of pay has been established so that a worker in the junior category who does well can earn quite more than his colleague who is his senior in position if the latter does not display diligence. An increase has also been created for seriousness, ingeniousness, depth in elaboration of a theme and a major practical effect.

Changes for the better also have taken place in the field of scientific work planning. Formerly it ranged on the absurd: please determine and break down by quarters a year in advance assignments by themes and provide the hypothetical economic effect. In science, however, this is far from always possible. The effect without exception is unpredictable. Moreover, sometimes it can be considerably greater than expected, but of a different quality. An unexpected change is possible not at the time or place where it was initially anticipated. What do you do then, abandon the search solely because it does not take that

route? Alas, the following occurred: for the sake of a designated figure, this item of the plan made it necessary to ignore truly productive work.

Today planning is no longer a hindrance to scientific research. The researcher is no longer required to throw dust in the eyes by compiling with detriment a long-range plan for himself. Plans have become realistic. They are compiled at the end of the year. Moreover, they can be corrected in the course of the year, even to excluding or, conversely, including new ones.

And more about changes. Of late, the collective's public activity has markedly increased. It actively discussed the Theses of the CPSU Central Committee and subsequently the materials of the 19th All-Union Party Conference. It worked out many serious proposals relating to problems of the economy, our republic's national sovereignty and its ecological condition. Meetings at the institute have become a great deal more interesting than before. Recently, a colleague who was accepted as a candidate for CPSU membership had to spend an entire hour answering pointed questions of the most diverse character.

[Question] **2. What in your opinion is hindering perestroika in science?**

[Answer] First of all, the point of view that people working in science are called upon to live and work on enthusiasm alone. The scientific stratum of the intelligentsia has actually dropped out of sight of the pertinent organs of our government. I don't want to draw somber pictures from the life of our institute's personnel, but a fact is a fact: it is necessary to work for a large part of one's life to obtain a dwelling accommodation. And that would mean a cooperative one, as it is better not to even dream of a communal one. I cannot but help mention a unique case. Quite likely nothing comparable has happened in any other of the country's institutes in the case where our doctor of sciences with his family had to stay for 5 years in a dormitory. And this despite the fact that the scientist's high scientific status automatically placed him among the first in precedence. I think that in the course of the time that the scientist was refused housing highly placed bureaucrats were able to get for their children more than one accommodation.

Many ride to work for us from Kaunas, Ukmerge, Kayshyadoris and other cities. And there they spend years moving from one place to another. The best years of a scientist's creative youth and maturity are often coupled to overcoming serious living inconveniences and consequently do not yield a full return. One's look at the problem cannot be simply sympathetic, it must be social. Not so long ago a young female associate left us. It was a typical situation: she rented a nook in Kaunas (she was unable to find one in Vilnius). There she was asked to leave. The young specialist found herself without a roof over her head and was obliged to return to her parents on a kolkhoz and to abandon scientific work. The years and money spent by the state on training failed to provide a debut for this young, and I venture to say, capable specialist in science—true payment for inattention to a person's needs.

What else hinders work today? Bureaucracy and the unintelligent centralization connected with it. It is far from eradicated. An endless paper flow continues to come to us from "above." Imagine, it has increased threefold compared to the time before perestroika. What is the reason for this? I think that because of the implemented reforms a cloud has been hanging over the bureaucrat. He has begun to fidget in his customary chair. He is attempting to prove his usefulness with all his might. But how does one prove it? Well, innumerable instructions are composed with redoubled energy, and "tempestuous" activity relating to their verification is in full swing. The benefit from them is not slight. But what bureaucratic holdups await, for example, a scientist who has received an invitation to a symposium or conference in another country! Even in this country. He has to provide himself with a countless number of certificates, authorizations and recommendations before he will gain the right to leave for a while his native hearth and home. This in our time of broad, direct cooperation with colleagues abroad!

[Question]**3. How do you rate the work of executive personnel in perestroika?**

[Answer] Depending on whom you have in mind! If you have in mind those who are responsible for the financing and development of basic science, the rating is poor. We know that the level of scientific and technical progress is determined by achievements in basic research which in our country is basically engaged in by academic institutes and VUZ's. But their financing is insignificant. Our institutes receive one-twentieth to one-fortieth of the funds of comparable scientific centers in the West. And our Institute of Semiconductor Physics gets only one-third of what other comparable institutes of the USSR Academy of Sciences receive, although we coordinate with union centers work on plasma and current instability in semiconductors.

How does one get out of this situation? The problem, it would appear, could be solved through the state order [goszakaz] on which many now place their hopes. But so far complete clarity is lacking as to what the state order actually is. Either something completely new and in need of an essentially new approach. Or the old well-known method of budget financing masked for all of us in a new guise. It is not clear whether we can count on the state order in correction of the plan for this year, not to speak of 1989, or whether we can count on the state order in financing basic work. Or whether it will be necessary to take the old route of providing for the normal operation of the institute by means of economic contracts. One cannot

do without them. The scientist is obliged to agree on conclusion of economic contracts in order to guarantee normal functioning of laboratories and institute subdivisions.

What are such contracts actually? As a rule, they are of an applied character or are connected with provision of some technical services. The nonproductivity of such work can be seen when you consider purely theoretically that some producer of art or a prominent writer switches over for certainty's sake to the newspaper profession (with no offence meant to journalists) and so to say bites at a trifle because of nonpossession of royalties. A writer has to dig deeper than a reporter and on a larger scale, while the return for his work does not always come instantaneously. The same applies to major scientists. My heart bleeds when I see a doctor of sciences dissipating his talents on the solution of minor problems. That can be done without him. But the problem lies in that no one pays for "pure" science, although it can in the course of things fertilize applied science manifold.

As for the institute's administrative staff, it listens more than ever before to the collective's opinion and proposals. Only in this way can glasnost, democracy and a healthy microclimate in the collective be ensured.

[Question] 4. Your opinion on the 19th All-Union Party Conference and its importance in the life of the country.

[Answer] We have arrived at that period when the most important, the most requisite words on glasnost, democracy and perestroika of the economy have already been said. The conference has become a key factor in the country's life, providing a direction not only to minds but also to affairs. Another question relates to the fact that at this critical stage the old methods still continue to exist in harmony with the new. We need ourselves to be concerned with our own health and to shift from words to business. The party conference was the precursor of perestroika. It illuminated our future path.

7697

Economic Standards Under Full Cost Accounting, Self-Financing

18140274 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 7, 5-18 Apr 88 pp 1, 6, 7

[Article by Candidate of Economic Sciences N. Berzon, docent of the Moscow Higher Party School, and Doctor of Economic Sciences A. Palamarchuk, professor of the Chair of Economics and Organization of Industrial Production of the Moscow Institute of the National Economy imeni G.V. Plekhanov, under the rubric "The Introduction to Cost Accounting": "When One's Hand Is Sovereign"; second in a series of installments; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] Today, when the majority of scientific research institutes and design bureaus have been converted to full cost accounting and self-financing, the role of economic standards is increasing significantly. The problem of establishing a specific set of them is examined in the second article of a series of reports that are devoted to the work of science under the new conditions of management. In accordance with their purpose economic standards are an effective tool of the stimulation of the work of the scientific organization and the coordination of its interrelations with the state and ministry. Let us see whether they are achieving their goal.

The economic standards adopted for 1988 are in effect until the end of the five-year plan and are not liable to reapproval. Their stability appears in this. It is a positive factor, which interests labor collectives in adopting intense plans, since after making settlement on mandatory payments the entire remainder of the profit or income (subject to the adopted form of cost accounting, see the diagram [diagram not reproduced]) is left to the scientific organization. Such a situation also stimulates the more complete use of production reserves.

But economic standards should also be dynamic, that is, should be formed first of all with allowance made for the achievements of science and technology, in conformity with the changes of the proportions of social reproduction.

The arising conflicts between the stability and dynamicness of economic standards should be eliminated by the establishment of the optimum terms of their effect. But not only that. A differentiated approach when establishing the amounts of payments for each scientific organization is also necessary. Are the latter conditions being observed in practice?

Thus, the amount of the tax standards for deductions to the state budget has been specified at 2 to 10 percent of the sum of the accounting profit. For organizations, which operate in accordance with model II of cost accounting, it is, as a rule, two-fifths to one-half as much, since the income in addition to the profit also includes the wage fund.

In the overwhelming majority of sectors the standard of deductions for the state budget has been set at the minimum level. True, several ministries and departments have sharply differentiated the amounts of the deductions with respect to their scientific research institutes and design bureaus. Thus, for the scientific organizations of the USSR State Committee for Construction Affairs, which have been converted to model II of cost accounting, the standard of the deductions for the state budget has been established at 0.3 to 9 percent.

But by what was this difference dictated? The standard is approved subject to the scientific and technical potential of the organization, which has been determined by the value of the fixed capital, the number of workers, and the anticipated amount of income. In short, they proceeded mainly from the motto: the "strong" one will solve all problems and will draw any payments.

Therefore, it seems, it would be more just to establish the standard of deductions for the state budget subject to the level of profitability of scientific organizations. The more profitable ones should pay the state at a higher percentage rate. During the transition period (1988-1990), if at scientific organizations "old" themes, which are carried over from past years and in the cost of which profits were not envisaged, and "new" jobs, for which contractual prices have been established, are fulfilled simultaneously, we would recommend exempting the organizations with a level of profitability of less than 20 percent from deductions for the budget. In case of an increase of the profitability to more than 20 percent the standard of deductions should be increased by 0.2 percent per percent increase of the profitability.

The financing of scientific research work of a sectorial nature and the aiding of individual organizations will be carried out by means of the centralized fund for the development of production, science, and technology and the reserves of the ministry.

Apparently, it is advisable to apply progressive taxation to the payments to the centralized fund and to the reserves of the ministry.

In addition to deductions from the accounting profit the scientific organization transfers to the centralized fund a portion of the amortization which is intended for the full replacement of fixed capital. The analysis shows that the spread of the value of this standard among sectors is inexplicable. Thus, for organizations of the USSR State Committee for Construction Affairs it has been approved in the amount of 50 percent, for scientific organizations of the electrical equipment industry—15 percent.

In our opinion, the amount of the deductions from amortization for the centralized fund should be established subject to the degree of wear of the fixed capital. Organizations that have "young" capital, in which the wear is low, should deduct more for the centralized fund

and, on the contrary, scientific research institutes and design bureaus, at which the capital is "old," should retain more assets for retooling (see the scale of the percentage deduction [figure not reproduced]). The differentiated approach to the approval of standards will contribute to the equalization of the economic conditions of the work of scientific collectives by the end of the five-year plan.

We have noted the mandatory nature of the stability and dynamicness of the standards, but, of course, they should also be economically sound.

From such a point of view the standards of the distribution of the profit, which has been left at the disposal of scientific organizations, and the standard of the formation of the fund of scientific, technical, and social development as a percent of the cost accounting income will hardly stand up to criticism.

The formed ratio between the economic stimulation funds during the base year (1986 was taken for organizations which had been converted to the new conditions of management since 1 January 1988) was made the basis for the calculation of the former standards. Therefore, when determining the amount of the fund of scientific, technical, and social development they included in it the assets of the development fund of the organization and the fund for sociocultural measures and housing construction, which existed during the base year, as well as the amounts of resourceful work and noncentralized capital investments.

Consequently, the standards are of an exclusively individual nature for each scientific research institute and design bureau and merely record for the remaining 3 years of the five-year plan the ratio of the economic stimulation funds, which were established earlier.

The standard of the deductions from the cost accounting income for the fund of scientific, technical, and social development, for example, for organizations of the USSR State Committee for Construction Affairs, is specified at 10 to 25 percent again on the basis, apparently, of a dispatch to a large ship—a large cruise.... The question arises: If these standards are economically unsound, does it make sense to approve them from above?

Why under the new conditions of management did they unite in one fund only the assets for the financing of social and technical development? The collective itself should specify how much money to allocate for the solution of social problems and how much for the goals of scientific and technical development. If we are to be consistent, it is necessary to take the next step: to give it the rights to distribute independently the amounts of profit (cost accounting income), which are left at its disposal. Why should the ministry dictate how to use them? It turns out that not full, but "proportioned" cost accounting has been set into motion.

The introduction for scientific organizations of a fee for fixed capital is also hardly advisable. And here is why: in spite of the fact that the standard has been established at the minimum amount (1-2 percent of the average annual value of the capital), its deductions are a heavy burden on the profits of scientific research institutes and design bureaus.

The fee for fixed capital was introduced for the first time in the middle of the 1960's for enterprises of industry, in order to interest them in the better use of production equipment and in the derivation of a larger profit with a smaller value of the capital. Enterprises have enormous opportunities for this: the changeover to a multiple-shift work schedule, the more complete utilization of equipment with respect to capacity, the sale of unnecessary equipment, and so on.

They also applied the same standard to scientific organizations. However, for scientific research institutes and design bureaus the possibilities of increasing the level of use of fixed capital are very limited. It is wise to convert to a multiple-shift work schedule only subdivisions that service computers, in order to utilize expensive equipment more completely. For other technical subdivisions there will simply be no work front. While due to the establishment of a fee for fixed capital a number of scientific organizations are revising their plans of technical development and are rejecting previously ordered equipment, although the technical level of many scientific research institutes and design bureaus does not meet the requirements of today. According to data of the USSR State Committee for Science and Technology, the machine-worker ratio of researchers in the USSR is approximately half that of workers, while in the United States, on the contrary, the machine-worker ratio of scientists is 1.7-fold greater.

Without denying the necessity of the efficient use of fixed capital, it should, however, be admitted that for scientific organizations at present the main thing all the same is to strengthen substantially their material and technical base, to develop pilot experimental works, and to establish new test units.

Now any engineer and scientist understands: if in the standards an anti-expenditure mechanism has not been formulated, they are not economic standards. This is an axiom. Then how is one to explain such a fact that standards of the formation of the wage fund subject to the value of the work performed on their own have been approved for scientific organizations which operate in accordance with the first model of cost accounting?

Thus we encounter a version of the gross indicators. The more expenditures the collective of a scientific research institute makes (the more raw materials, materials, and special equipment it uses), the more it will earn. Therefore, it is necessary to use more resolutely the second model of cost accounting, where the fund for the remuneration of labor is formed as the balance of the income

after all payments. While it is possible to regard the first model as a temporary one during the period of the switching to the rails of the new economic mechanism.

Thus, the experience of the work of scientific research institutes and design bureaus under the new economic conditions testifies that the previously formulated set of economic standards requires flexible adjustment.

7807

New Financing System for Academy of Sciences Explained

18140305a Tbilisi ZARYA VOSTOKA in Russian
7 May 88 p 2

[Article by Givi Chivadze, party buro secretary, GeSSR Academy of Sciences Institute of Physical and Organic Chemistry, doctor of chemical sciences, professor, under the rubric: "New Economic Management:" "The Development of Contract Projects for Academic SRIs Should Provide Practical Solution of Important Scientific and Technical Problems." Passage in boldface as published]

[Text] **The 27th CPSU Congress and subsequent central committee plenums have named the introduction of new forms of financing in the USSR Academy of Sciences system as among the most important tasks in the basic restructuring of science. To this end, the CPSU Central Committee and USSR Council of Ministers Decree "On the Conversion of Scientific Organizations to Full Cost-Accounting and Self-Financing" stipulated the creation of a new financing system for programs instead of the previously existing principle of financing for individual scientific establishments.**

The old system of financing institutes created conditions for equalization with respect to all scientific structural subdivisions—to departments and laboratories, regardless of their output. Thus, if several different groups worked in a laboratory, it would suffice for one of them to work effectively and at a high scientific level, and the entire laboratory on the whole would receive financing.

Under the new system, instead of financing institutes, the individual topics or scientific trends, which have undergone the appropriate preliminary expert analysis with a view to their long-term prospects and topicality, will be financed. The decree requires the USSR Academy of Sciences and the Union republic academies to raise the efficiency of academic science and ensure an increase in its contribution to the acceleration of scientific and technical progress and the solution of the most important problems of socioeconomic development. The task was formulated of significantly raising the level and topicality of basic research, providing for its advanced development, strengthening scientific and national economic performance, and intensifying experimental design and engineering work.

According to the decree, all academic scientific organizations should convert to the new form of financing starting in 1989. The basic share of work by all academic institutes should be aimed at developing basic research, which will be financed through the state budget. This includes research carried out on assignment by administrative agencies (state order), research within the framework of all-union scientific programs approved by the USSR Academy of Sciences Presidium and USSR Academy of Sciences departments, and initiative-minded research of an exploratory nature, set up directly by the institutes themselves.

Clearly, this approach to the problem significantly increases the responsibility of institute and subdivision managers and all scientific workers for the final outcome of research and will improve the quality of the work being performed. A flexible economic mechanism that permits different organizational forms of financing will promote the creation of temporary structural subdivisions for practical work on individual topical problems. Obviously, the creation of such temporary subdivisions is expedient in case promising results in basic research by one or another laboratory are obtained which have great practical significance, the rapid implementation of which is determined by national economic needs. In such a case, scientific workers may gain additional pay within a limit of 30-50 percent of their basic wages, which will provide them material incentive.

In this regard, particular attention must be given to forming intra-institute temporary collectives involving talented young people. One feature of temporary collectives is the fact that their employees will be able to utilize all the working conditions and scientific and technical equipment in the new structural subdivision, yet they have the right to return to their previous jobs after the collective has fulfilled its task.

Funds obtained through economic contracts are the most important source of financing for scientific organizations stipulated by the new system, independent of the state budget. Work done on contract will be performed using the funds of the customers—ministries, departments, associations and enterprises.

The share of work done on economic contract projects should be increased to 25 percent of the overall total financing of academic scientific research institutes. By the same token, the solution of important sectorial and inter-sectorial scientific and technical problems will be ensured within a brief time period through the use of comprehensive contracts and other methods for integrating science and production. The difference between funds obtained through contracts and the performer's actual expenses comprises the profit, from which a portion is deducted to form economic incentive funds for scientific establishments and their employees. This form of financing will contribute to strengthening ties

between science and production and to the most rapid possible application of developments, since both the customers and the performers of the work will be maximally interested in this.

Our institute has some experience in performing contract work. Thus, the "Noriol-A" luminophor, which the institute developed for luminescent fault detection, has been produced in experimental production over a number of years for more than 50 ship-building, machine-tool building, machine building, airplane-building and other enterprises and organizations. It is used to detect surface defects in metallic items.

The institute's modified materials sector has set up production of metal chelate preparations from natural compounds, intended for the struggle against various agricultural plant diseases. They are improving crop quality and promoting an increase in crop yields. Several tons of this preparation are produced annually for the needs of the republic and is purchased by sovkhozs through contracts. Production expansion is planned in order to fully meet the republic's needs for chelate preparations, as well as for natural zeolites and highly effective modified chelates.

Production has also been set up in the sector for surface-residue sorbents used in gas chromatography, which are purchased by interested organizations in the country. One of the basic components for preparing a compound used against citrus crop pests is synthesized for the Batum Chemical Plant.

For the second year already, our institute is making a granulated trichlorfon preparation, effective against agricultural pests, in experimental production through an order from the "Gruzselkhozkhimiya" Scientific Production Association. Jointly with the Mountain Forestry NII imeni V.Z. Gulisashvili, we have developed an original design for a polyethylene barrier trap for capturing forest bark beetles. A contract has been signed for us to manufacture them in experimental production. A contract was also recently signed with the State Scientific Research Institute For Chemistry and Technology of Organic Element Compounds (GNIIKHTEOS) for joint work to develop compositions for hermetic sealing using Georgia's natural aluminosilicate deposits. It is intended for use to hermetically seal joints in the construction of large prefabricated buildings and is of interest to republic construction organizations.

Our institute is carrying out experimental production work through a partnership contract with the "Avtotekhobsluzhivaniye" Production Association to develop a method for recycling used automotive oils.

On a request by the "Tbilkozhobyedineniye" Production Association, our institute has developed a technology for the efficient re-processing of wastes from leather and hide production, in order to create high-calorie food additives for the livestock industry. A technical production line for producing the additive has been installed in the institute's experimental production facilities. An experimental batch has been produced for product testing in the swine industry.

All of this contract work creates real opportunities and serves as an economic base for the institute's conversion to the new financing and economic management methods in 1989.

In order for academic institutes to successfully convert to the new form of financing, the cadre problem must also be solved. Consequently, the principles asserted in CPSU Central Committee resolutions in this area should be implemented: the management staff and scientific workers' collective should be rejuvenated. Furthermore, the procedure for filling managerial positions in the institutes must meet the interests of scientific development and its growing role and responsibility in the acceleration of socioeconomic development. Therefore, the election of institute and scientific subdivision leaders, the effectiveness of projects and the conversion to new organizational forms should be coordinated within a unified system and, in such a manner, conditions should be created for raising the effectiveness of scientific work, an influx of fresh creative forces, and for discovering the talents and capabilities of scientists. It is particularly important to considerably expand the participation of the scientists themselves, the party organizations, and the institute and subdivision labor collectives in the discussion and solution of cadre problems and in the democratization of scientific life. After all, the economic and legal grounds for the economic activity of scientific organizations arise from regulations in the USSR Law on the State Enterprise (Association).

The implementation of the CPSU Central Committee and USSR Council of Ministers decree excludes the waste of state funds for the performance of basic research that has no significant influence on the development of science, that does not provide a groundwork for fundamentally new technical solutions or for work on important social and economic problems.

The enumerated tasks represent the first stage of financial reform. The numerous problems which have accumulated in the area of financing academic scientific establishments still await a definitive solution. Beyond a doubt, there are still difficulties along this path. The need to develop a special program for financial improvements in the USSR Academy of Sciences system did not arise accidentally.

In order to fully and definitively solve the most important problems of converting to the new economic management conditions, each scientist, party organization and collective of our academic scientific institutions must display initiative, boldness and a creative approach and must work in the spirit of restructuring and revolutionary transformation of our society.

13362

Coordination, Funding Problems Plague New S&T Cost-Accounting Center

18140305c Moscow SOVETSKAYA ROSSIYA in Russian 29 May 88 p 2

[Article by A. Nemov: "Do the Stairs Go Up? Why Parasites Immediately Appeared at Cost-Accounting Center"]

[Text] The first article about this unusual center in the city newspaper was entitled "Note this Address." It was assumed that readers would most likely want to know where the Moscow Cost-Accounting Center for Scientific and Technical Services "Introduction. Research. Design. Organization," abbreviated VIPO, was located. Let us take a look inside the old building on Sadovaya-Kudrinskaya, 18. Behind the door a marble staircase begins, which seems like it is leaning against a large multicolored stained glass window. An impressive chandelier also enhances the feeling of splendor. Well, after all, all of this attests to the establishment's well-being. After all, the remodeling of the building was carried out with the cost-accounting center's hard-earned money. Incidentally, my "thoughts on the main entrance" did not evoke enthusiasm on the part of Kirill Orlov, VIPO director, candidate of technical sciences. He merely added gloomily: "My eyes do not see this chandelier."

Let us begin with its history. Today, one often has occasion to hear from sectorial institute employees that it is unprofitable for them to undertake innovative work, that it is more expedient to work peacefully upon dissertations. Why exert oneself? It takes 10 years to implement a simple project. Even discoveries which could accomplish an industrial revolution are "buried" by production workers themselves. Scientific research institute employees have given me examples, in which designs took years to find their way into practice. They recalled continuous steel casting, hydraulic coal mining, composite materials.

The renovation that is gradually (and with much difficulty) entering our lives has touched science as well. Scientific workers want real work, they want their projects to be rapidly implemented. In many respects this is realistic. Regardless of desperate resistance from the ministries, enterprises are finding their independence. Today, as never before, improved technologies, promising machines and interesting ideas are needed. The demand that has arisen for the results of intellectual labor also dictates new forms for organizing the work of scientists, inventors and engineers.

Previously, many people had come up with an "insane" idea: there is no need to have an entire institute, in which in addition to talented people there are also many mediocre ones, in order to rapidly solve some sort of project, research or scientific problem. Sometimes it is adequate to set up a collective of 20-30 creative individuals. Opponents to this approach appeared immediately. Somebody felt threatened: if 10 people can handle a task that a thousands-strong SRI collective takes years to solve, it is easy to conclude that it is time to close down the institute.

Most likely, it is a sign of the times when initiative from below is reinforced by support from above. Kirill Orlov did not have to walk for ages through the offices of scientific administrators. Thanks to the active position taken by All-Union Council for Scientific and Technical Societies (now the Union of Scientific and Engineering Societies of the USSR) leaders A. Ishlinskiy, D. Levchuk and A. Vladislavlev, VIPO came into being.

Some people come to this center in desperation. In July of last year, the VNIIlitmash Scientific Production Association was faced with the task of creating a new union-wide price list for castings, forgings, and drop forgings. Considering the fact that each machine building plant needs a price list, half a year was allotted for the entire project. The VNIIlitmash Scientific Production Association turned to several sectorial SRIs. The institutes did not turn down this work, but they did set a condition: such a volume of materials (over 20,000 complex documents) would take about 1 and a half to 2 years to process, and this would cost the customer about 500,000 rubles. The association had the money, but the time period was unsuitable. It then turned to the cost-accounting center, which promised to complete the work in half a year. The Scientific Production Association signed the contract, according to which it was required to provide all the necessary documents for processing by September. However, VIPO did not receive the documents until the end of November. Less than 3 months remained in which to finish the project. It is easy to imagine what Andrey Yefimov, the leader for this project at VIPO, candidate of economic sciences, experienced.

"Of course, we could have refused to cooperate," he said, "and thus, probably, any sectorial institute would have dealt with the situation. Moreover, there were more than enough objective reasons to reject it. However, our center had already won a reputation as a reliable partner. The temporary collective that was working on the price list was forced to extend its 'work time'. I shall explain: I am referring, of course, to their time free from their basic jobs."

By the end of February, the VNIIlitmash Scientific Production Association had received the completed job, yet the cost-accounting center showed an account of 69,000 rubles. Yet after all, the association had been prepared to pay more by a factor of 7-8!

Does this mean that temporary creative collectives can work effectively? Let us consider the program for the social and ordinary reconstruction of the capital. The drafts of the general plan for a "children's zone" in the new zoo, for the medical-forest school No. 8 in Odintsovskiy Rayon, and for Mostransagentstvo were done by

the cost-accounting center within the estimated weeks, when, as it is traditionally thought, construction research and drafting work requires no less than 2 years.

To some people such speed seems suspicious: "To be sure, they are raking it in over there, but they work all night."

K. Orlov, VIPO director, states:

"A temporary collective member who participates in project work can add 120-150 rubles per month to his basic wages. Serious scientific design work is better paid—it is possible to acquire 400-500 rubles per month. I would like to add that the temporary collective distributes the money itself. Each person's contribution is evaluated jointly. For those who cooperate with VIPO, of course, material incentive plays a role, yet it is far from the only one. People come to us for the sake of realizing their own creative capabilities. It is precisely for this reason that we accept orders from organizations for projects and designs which will be mandatorily implemented and applied."

"Let me explain—VIPO has only three staff employees: the director K. Orlov, the chief engineer (he is also deputy director) A. Dotsenko, and chief bookkeeper O. Khrapenkov. This is entirely sufficient to direct the development of the entire cost-accounting center, to manage it. The main personnel of VIPO are social experts. These are scientists who have already proven their professional level by solving significant scientific problems. It is precisely they who are entrusted to make up temporary creative collectives. On obtaining an order, we turn to the VIPO card file, which has information on more than 1000 scientific employees at institutes in the capital. A brigade for solving a specific problem is formed virtually in the course of 1 or 2 days."

A. Yefimov says:

"Our card file includes, I would say, the intellectual "plums" of the capital in several areas of knowledge. Thus, a temporary collective's potential is very high."

"Why is the word "social" attached to the word "expert"?

"I form creative brigades of scientists based on social principles, i.e., for free. Two or three evenings per week I meet with citizens and organizations at VIPO. Anyone can turn to us with a proposal to implement his own idea. If, in my opinion, the idea is tempting, it is sent to the scientific and technical council, which makes a decision on financing its development and future application. Naturally, the social experts evaluate the suggestions within the framework of their own specialties. For instance, let me cite computer equipment and ASU. G. Sukharenko evaluates project and design work, S. Nanushyan—chemistry and biology, and D. Churikov is a specialist in various machines and mechanisms. I also meet with potential customers and help them to formulate their order more precisely and evaluate its effectiveness."

"For now, could you tell what you do for free and what you are paid for?"

"I am paid only for specific work on the staff of a temporary creative collective after, it goes without saying, its application."

"Does it turn out that you are completely deprived of free time? Is this not too great a sacrifice?"

"We are not only organizers, but also scientists. Take Sergey Nanushyan: what did he come to the center with? An idea for creating a promising fiber optic sensor for physical quantities. This is the leading edge of world science. Sensors are required for the electronics and radio engineering of tomorrow. In their own work in this field, the Americans, so to speak, cannot come within a mile of us. It would seem, that S. Nanushyan, since he has results, should be invited to the most prestigious institute. However, this did not happen. Not everyone was ready for fiber optics. This is why only the center supported Sergey's work. Today the situation is changing. The USSR Academy of Sciences Institute of Physical Chemistry is beginning to cooperate with us in this area."

"Or, let us consider the new technologies for road building using highly productive machines for the vibrodynamic compaction of soil and concrete. In November, a group of Moscow engineers had suggested this design. In December, after examination by the scientific and technical council, the center purchased it using its risk fund. A temporary collective was created (about 100 people) which, over several months, completed drafting the scientific and technical documentation and sent it to a plant for the manufacture of an prototype model of the machine. Experimental tests of the unit will start in July, and by October, we hope, a Moscow-area customer will acquire more than 10 kilometers of high-quality concrete road."

"Really, is not the rapid embodiment of his idea and recognition in his own life time, instead of after death, with which our history is rich, important to the inventor?"

"You mentioned a risk fund."

"How is the center's income distributed? Half is spent on material incentives for the temporary collective, 35 percent goes to the state and 5 percent comprises the risk fund, which is needed in order to finance promising ideas."

"The VIPO has practically no equipment of its own, but research is often inconceivable without modern devices."

"We rent entire laboratories at several institutes in the evenings. Not all scientific research institutes willingly agree to this. Some managers prefer it if the instruments work only a few hours per day, acting on the principle 'not for myself, and not for the people.' However, so to speak, this will only last for a while, until VIPO has its own excellent experimental base."

I would also like to finish the story about the cost-accounting center on a cheerful note, but all the same I must return to the beginning of this article and explain why the director, Kirill Orlov, gazes joylessly at the splendid marble staircase leading to the second and third floors of the building on Sadovaya-Kudrinskaya, 18.

There was a slight inaccuracy: not only VIPO is located at this address, but also the Moscow Council for Scientific and Technical Societies. The cost-accounting center was set up under it, by a resolution of the All-Union Council of Scientific and Technical Societies. The relations of VIPO and the Moscow Council were immediately stipulated in a clear contract: VIPO will involve members of the capital's scientific and technical societies in its activities, allowing them to display their own creative capabilities and thus solving important scientific and technical problems, and the Moscow Council will render any sort of cooperation to the center, be it the premises or providing for the three staff employees (the director, chief engineer and bookkeeper).

It is obvious that both sides should gain from such cooperation, yet the main thing is the work. However, they were thinking of work least of all in the Moscow Council of Scientific and Technical Societies, when point after point they began violating the conditions of the agreement. First they set new requirements for granting premises: VIPO would receive two rooms, if it paid for repairs for the entire 3-floor building in which the council is located. True, they promised to return the money eventually. The VIPO director reluctantly sent almost 80,000 rubles. Months passed, and the council returned only 5,000 rubles. However, after all, the center is cost-accounting, and you cannot call this "loan" anything other than a quit-rent. Therefore, Kirill Orlov cannot calmly view the chandelier and marble staircase—people are paying for these indulgences with their own labor. The final point of the contract was also violated. As a result, the labor of Orlov himself (as well as that of the chief engineer and bookkeeper), figuratively speaking, is worth nothing. Although VIPO is official and has been operating since last September, the Moscow City Council has not paid them a wage all these months. However, an AUCCTU regulation clearly stipulates that the council should find precisely its own wage fund for the center."

Other conditions are also unfulfilled. Why does V. Kryukov, deputy chairman of the Moscow City Council of Scientific and Technical Societies (his position is now named differently) struggle with all effort against VIPO, which the All-Union Council had organized? This warrants more detailed investigation. However, first let us hear how V. Kryukov explains withholding the wages:

"There was a slight misunderstanding. We did not know that precisely we were supposed to pay them."

"A slight misunderstanding"—and for 9 months people have not received their wages. "We did not know that we were supposed to pay," yet they took the money "for repairs" without a second thought, and they also willingly accepted the bonus from the All-Union Council for cooperating (!) with the VIPO organization.

Incidentally, the reason for V. Kryukov's position is easily found. **Here is the opinion of A. Dotsenko, deputy director of the VIPO:**

"Today scientific and technical societies are converting to cost-accounting. For many councils, which are simply unprepared for this, this is financial bankruptcy. V. Kryukov got the idea of collecting 35 percent of VIPO's income for the Moscow Council's fund: after all, one must somehow maintain the equipment. However, when V. Kryukov found out that this contradicts the law, he immediately lost interest in the center. After all, the center only pays for work."

The opinion of T. Ostrovskaya, deputy chairman of the board, Moscow Scientific and Technical Society for Non-Ferrous Metallurgy, helps clarify the situation:

"Previously, scientific and technical societies were financed through the receipt of membership dues and legal fees from organizations. The money was enough for us to support staff workers and hold functions (conferences, seminars, congresses). Today, many enterprises have converted to cost-accounting. They are refusing even to pay for membership in a scientific and technical society. For instance, the Moscow Aluminum Alloys Plant justifiably requires solutions from us for the scientific and technological problems which face it. Only in this case does it intend to pay money. What solution do I see?—Active involvement in creating cost-accounting temporary collectives to solve specific problems. The boards of scientific and technical societies should actually serve as guides for scientific and technical progress."

The approach that T. Ostrovskaya mentioned does not promise a peaceful life. One has to go to enterprises, meet with scientists and, the main thing: one must professionally investigate serious scientific problems. Of course, not all employees of the Moscow Council apparatus can manage this. Some, as before, dream of a peaceful existence in a large office, led to by a marble staircase. However, this staircase only leads nowhere. The contract with the Moscow Council goes out of effect after a year and another one will be concluded: VIPO is now thinking very hard.

When I left the building on Sadovaya-Kudrinskaya, 18, it was almost 22:00 hours. Only VIPO's windows on the second floor were lit. The masters of the Moscow Council's premises were already at home and were, possibly, watching "Projector of Restructuring" and, I hope, that nonetheless they were thinking of their personal participation in it.

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Self-Financing Creates Turmoil Among Research Organizations

18140305b Moscow EKONOMICHESKAYA GAZETA in Russian No 19, May 88 p 6

[Article under the rubric: "Self-Financing: Experience, Problems. The Reader Continues Discussion:" "Disputes On Prices For Scientific Products Are Not Subsiding." Passages in boldface as published]

[Text] More than a million workers in scientific organizations are now mastering cost-accounting economic management methods. This process is occurring with difficulty, as was noted by participants in the "EG" business club meeting, a report on which—"Science and Cost-Accounting: The First Steps" was published in issue No 6. In particular, the heated disputes over the procedure for determining contract prices for scientific products are not abating. Let us recall what USSR GKNT representatives firmly stated at the meeting, regarding their department's position: the State Committee on Science favors free price-setting. In their opinion, price is a contract matter between customer and executor, and regulating interference by a third party is impermissible. Any attempt to regulate the procedure for setting contract prices contradicts the ideas of cost-accounting.

All the same, however, our editorial mail indicates that many readers do not share this viewpoint.

"I am convinced," writes V. Zhuravlev, economic planning department chief at the Zlatoustovsk Metallurgical Plant, "that norms are needed for determining contract prices!"

V. Sichkar, scientific research institute laboratory head, economists P. Rudenko and L. Semenov, and others propose their own methods for calculating prices.

"How can this be?" wonders I. Dyakonov, juridical bureau chief at a Leningrad institute. "The typical protocol for agreeing on a contract price has no economic grounds whatsoever. There is not even a reference to budget cost: only the contract price is indicated. All of our attempts to obtain grounds for the price are deflected."

Similar questions and opinions appear in other letters as well, some of which we are publishing today. The editors, in consideration of the readers' desires, shall continue the discussion of this problem in "EG."

[Letter by A. Marshev, deputy minister, USSR Ministry of Instrument-Building, Automation Equipment and Control Systems: "Expensive Does Not Mean Unprofitable!"]

The fact that scientific and technical products have been granted commodity status and can be "bought" at contract prices is, in my opinion (and I have worked in production for more than a quarter of a century), profitable to both the customer and the scientific, design, or engineering organization. It is possible to arrive at a mutually profitable agreement regarding any detail: time periods, quality, efficiency. Both extra charges and discounts can be allowed for, and any matter can be regulated, including rigid sanctions against failure to fulfill contract conditions.

As a production worker, I can now purchase what I need: an idea, a narrowly focused study of a problem, scientific consultational "guidance" on one or another production improvement measure, or any scientific or technical service.

Expensive still does not mean unprofitable! In spending "his own" money, today the customer inevitably should compare the expenses and the proposed income resulting from application of the development. Throughout the world, scientific and technical work, even consultation, costs a great deal.

Now, of course, in the first year of the operation of contract prices formed by agreement among the parties, not only a lack of understanding is being manifested, but also an ignorance of how to use the "freedom" which has been granted. We have let the little beast out of its cage: "Run!"—yet it has somehow forgotten how to run! We are not used to determining and substantiating the price of that which we do or that which we need by ourselves. However, this must be learned! Scientific and technical products have become expensive, but, after all, the developer's responsibility has also increased. Previously, the demands placed upon him were formal, whereas now, if the goal is not achieved, the customer can recover his expenses with interest, so long as this was all written in the contract. The game is, so to speak, without risk of loss. Therefore, I vote for "freedom of activity in scientific and technical progress" and, consequently, for contract prices for scientific and technical products!

[Letter to the editors by L. Pokusayeva, I. Poplavskaya, scientific workers at the "VNIKTIneftekhimoborudovaniye" Institute, and L. Vasserman, laboratory head, candidate of economic sciences: "How We Trade..."]

As of this year, our institute, "VNIKTIneftekhimoborudovaniye," has begun working under the new conditions of full economic cost-accounting and self-financing. Only the first steps have been taken, yet today it is already possible to state that the institute is not experiencing particular difficulties with self-financing and

acquiring an income. Contract prices for scientific production play a decisive role in this. Let us be frank: price-setting now depends essentially on the developer's capability of arriving at an agreement and "extracting" a higher price from the customer. Since the developers have different goal-achieving capabilities, the prices "float" as well. The average planned profitability for an institute is 37 percent, whereas through contracts with ministries it is 28 percent, and with enterprises—over 42 percent. Moreover, on some individual projects profit exceeds expenses by a factor of 2-3, yet on others there is none.

Perhaps the most effective developments, through which the equipment of the future is created, have fallen into the high-profit category? Unfortunately, this is not always so. For example, the developer of a domestic component for the production of modern high-performance metal-cord tires, manufactured through a license from the Italian "Pirelli" company, provides the institute with all of 16-26 percent profit in the contract price. Yet, after all, these new items will correspond to the highest world standards and provide for an annual economic effect due to the replacement of imports totaling over 3 million rubles. As far as prices "by agreement" are concerned, developments in the creation of a highly effective high-grade wax compound for protecting agricultural equipment in rust-prevention treatment and garage-less storage, a new brand of petroleum ceresin for the impregnation of condensers which are used in the radio engineering and electronics industries, and others have also turned out to be unprofitable.

Customers for work on involving technical assistance in evaluating the work efficiency of the equipment and pipe-lines of technological installations have turned out to be more "generous." The contract prices agreed upon with them provide a profit of from 75-217 percent for such work. What about scientific and technical level? It has not been determined for such work, yet the annual economic effect from their application at one enterprise does not exceed 100,000 rubles. Contracts for drafting methodological instructions and other types of documentation have also turned out to be profitable. The profitability of such work consists of 40-130 percent. It is little wonder that the scientific and technical level has not been determined here either, since it is not always possible to calculate the economic effect.

As we see, the amount of profit in a contract price does depend directly on the scientific and technical level of production, but results from a subjective decision by the contracting parties. It goes without saying that such a mechanism for setting prices for scientific and technical production makes it possible to acquire profits which are not always deserved and to defray any expenses for research and development, and also reduces cost-accounting interest in resource conservation and, primarily, in creating highly efficient equipment.

What is the solution? Evidently, well-founded price-setting methods for scientific production are needed. Perhaps, differentiated standards for forming a profit depending on the scientific and technical level of the work should be established? For example, there could be a 50 percent profit for a level higher than world standards, 30 percent—for a level corresponding to world standards, and up to 15 percent of the annual cost-accounting effect, for other work.

Since, in the final account, the enterprises that use scientific production establish their own cost-accounting funds through the cost of the products created and implemented by them, the economic effect of new equipment for them is related above all to its effect on profit formation and on the improvement of other technical and economic indicators.

How should the profits for work which creates a social or other useful effect be determined? In this case, in our opinion, it would be expedient to establish standards for the formation of profits of up to 30 percent of the planned research and development expenditures, depending on the significance of the developments, as agreed upon with the customer.

There is no need to fear that a pre-determined dependence between the amount of profit and the technical and economic effectiveness of the work will turn into a return to the command-type determination of the profitability level of scientific organizations, as USSR GKNT representative A. Kazakov stated at the "roundtable" meeting ("EG", No 6). His misgivings that a large number of people would have to be involved in price-setting in science are in vain. Assuming the existence of standards, no one will have to be involved. Institute workers would be engaged in this directly.

[Letter to the editors by A. Volnov, deputy director, tire industry scientific research institute for scientific work: "How Much Money In the Customer's Purse?"]

The materials from the "roundtable" business meeting "Science in Cost-Accounting: The First Steps" sparked great interest among specialists at our institute. As an example, it cited the fact that at the beginning of this year five of the leading institutes of USSR Minneftekhimprom were unable to conclude contracts with enterprises totaling from 600 to 900,000 rubles. This is indeed true, and our institute is one of these.

These difficulties, in our opinion, are a consequence of the fact that sectorial enterprises converted to cost-accounting and self-financing a year before the institutes. The standards established by them for forming funds for the development of production, science and technology have turned out to be inadequate to finance scientific design work. Yet, USSR Minneftekhimprom has financed only those few of the institute's design projects which have a general sectorial significance, using its own funds.

One of the most complex and pressing questions in converting the institute to full cost-accounting has become that of setting the contract price. It has turned out that the value of a contract depends not so much on the effectiveness of the design, as on the customer's financial possibilities. The higher an enterprise's standards for deductions from profits for the budget and the ministry, the less useful it is as a partner for the institute, since the contract price will be lower.

However, we have found a mutually acceptable practical solution to this difficult problem. It lies in the following: having "outlined" the overall amount of the contract price, actual payment for the work is made over several years, proceeding from the customer plant's actual possibilities.

In this regard, it seems to us, in the 13th 5-year period it would be expedient for all sectorial enterprises to adopt unified norms for distributing profits to the budget and to ministry funds, in order to place them under equal conditions for ordering and purchasing a scientific commodity.

Difficulties during the first months of work under cost-accounting have forced us to seek new solutions.

We have begun concluding contracts not only with tire and tire-repair enterprises which, in point of fact, are connecting links between the developers and the consumers, but also with tire-consuming enterprises, particularly the Volga and Gorkovskiy automotive plants. In concluding contracts with enterprises of other ministries, we realize that the circuit of interrelations here has not yet been debugged, yet we will improve it together, in order to bring developments to the consumer more rapidly.

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Industry Now Contracts on Paid Basis for Training Specialists

18140248a Moscow NTR: PROBLEMY I RESHENIYAinRussianNo 6, 1988 pp 2

Interview of Anatoliy Georgiyevich Porshnev, rector of Moscow Institute of Management imeni S. Ordzhonikidze, by S. Abramov: "Specialist by Contract"; first two paragraphs are source introduction]

[Text] For our VUZ's, new relationships with industry, A. Porshnev, the rector of Moscow Institute of Management imeni S. Ordzhonikidze, states, been established with industry. In order to secure a required number of graduate specialists, the sectoral ministry to which the requesting enterprise is subordinated concludes a contract with the USSR State Committee for Education. And only when the enterprise pays 3,000 rubles from its fund for development of science and technology for each engineer or economist applied for, will these come to its shops, departments or laboratories."

The full cost of training a specialist is, of course, much higher. It depends on the specialty and on the VUZ in which the student is studying and can vary from 6,000 to 15,000 rubles. In addition, the cost of higher education is constantly growing. Sizes of students' stipends and salaries of instructors are being increased. Equipping laboratories with equipment and computers costs more. Such a process is characteristic not only of our country, but in our case a significant gap has been created between the present cost of education in higher school and the budgetary monetary assets being allotted for it. Additional revenues from sectors of the national economy will partially help solve this problem. Consequently, the quality of training specialists will be raised. Which is the objective of perestroika of higher school.

[Question] Anatoliy Georgiyevich, what effect will the innovation have on the prestige of engineering work?

[Answer] Only a positive one. The payment of enterprises for a graduate specialist must radically change the attitude of production people toward him. The fact is that up to now it has been easier for an enterprise to place an order for an engineer than to find a worker. It allocates annually quite sizable funds for the training of qualified workers and the creation of suitable social and living conditions for them. But the plant secures practically as many graduate specialists as indicated in the requisition, moreover, without spending a single kopeck for this. Management has displayed little concern in regard to the life of young specialists—all the same, they do not have the right to leave an enterprise for a period of 3 years. But even if someone after that period of work does leave, the vacancy can be easily filled by an order. As a result the engineer has depreciated in value. It is no accident that about half a million graduate specialists have been "requalified" into workers.

[Question] I remember even justifying this process, considering it a natural one. They say that present-day electronic equipment can be operated competently only by people with a higher education.

[Answer] No one argues that it is difficult to work with modern equipment without high qualifications. But the system of vocational training is engaged in training such personnel and it is not necessary to replace it.

Payment to higher school for graduate specialists should result in a more rational utilization of them in production and in more justified requisitions for them. We immediately felt this under the conditions of transition of a significant portion of enterprises and associations to the new conditions of work.

The closer contact of VUZ's with industry promotes the solution of the February (1988) Plenum of the CPSU Central Committee. According to it, in addition to the distribution plan, a kind of state order for specialists, educational institutions will distribute a portion of the graduates on the basis of direct contracts with enterprises.

Payment for the training of a graduate specialist also qualitatively changes the principle of enterprises sending workers and employees to institutes and universities. Now there is being added to the 3,000 rubles paid in the form of a stipend to its student the same amount for "buying him back" from higher school. And managers of plants and factories, especially under the conditions of cost accounting, will now think in advance whom and why to send for study.

[Question] There are enterprises that pay nothing for the training of specialists, for example, those operating at a loss. What will they do?

[Answer] I think that the ministry has to help those under its custody which find themselves in a difficult financial position. In the final analysis, personnel renewal and the influx of new forces are also a way of dealing with production unprofitability and low profitability. But basically of course, an enterprise has to take money out of its own pocket and put it in the pocket of the VUZ. More precisely, for the USSR State Committee for Education. And in my view, such a situation in which VUZ's really do not see money for professional work does not jibe with the principles of cost accounting.

I would like to point out the promising character of the changeover to cost accounting for the VUZ system of training and improvement of personnel's qualifications. We are also thinking of gradually changing over to such a relationship with industry. I would like to bring to mind that our institute is training and retraining about 1,000 persons a year at the faculty of organizers of industrial production and construction. Moreover, at special evening faculties, many Moscow people with a higher education acquire a second specialty without separation from production. Consequently transfer of the system of retraining to cost accounting will provide us with additional money for further improvement of teaching and research work and incentives of instructors. This will oblige managers of

enterprises to select students more carefully, giving preference to those specialists whose retraining would bring a real benefit to production.

Thus our institute set itself the task of training the entire management apparatus of the enterprises of the Volgogradskiy Rayon of Moscow for work under the new conditions of management. But if our rayon consultation centers now help, for example, the Frezer, Stankoagregat and other plants free of charge, then it will make sense to think today of a new form of payments.

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Secrecy Mechanism Lacks Legal Basis

18140027b Moscow NTR: PROBLEMY I RESHENIYA in Russian No 15, 2-15 Aug 88 pp 6-7

[Article by F. Vladov and V. Pokrovskiy: "The Retreat of Secrecy." Passages in boldface as published]

[Text] Indeed, ideas are carried in the air. We received V. Ozhegin's article at precisely the same time that the editorial office had already prepared material on problems of secrecy and our correspondents had met with Glavlit representatives and competent specialists from other organizations. Their evaluations of the situation sometimes coincided almost word for word. However, at the time, neither we nor our interlocutors even suspected that a summary of these conversations would turn out to be a unique commentary for a scientist's opinion.

Our interlocutors unanimously stated that the extraordinary secrecy, which over several previous decades has tangibly influenced the development of science and technology, has begun to surrender its position in recent years. Tightly locked archives are being opened up. Obsolete information is being declassified and the classification procedures are being considerably simplified. Something is occurring, which not long ago we would not even have thought of: foreigners are being allowed to inspect our military plants, the military MIG-29 fighter is flying at an exhibition in England...

Meanwhile, of course, this is only the beginning of work to change the system of secrecy itself. However, even the existing system, with all of its pluses and minuses, could work far more effectively if those for whom it was created would not behave at times like the "Holy Roman Pope." The rights which it grants are not used in practice: often, specialists do not know of their existence or simply ignore them. Secrets multiply like rabbits, precisely at the lower levels of the pyramid. For instance, there is a resolution in accordance with which work classified as secret can be quoted in the open press—of course, only those sections which are not secret. However, even those who know about this resolution rarely use it, fearing "what if something got out." The history of the author's certificate—a document which was at one time required as an indispensable supplement to an article and act of expert examination, already seems quite strange. Many years have passed since the author's certificate was abolished and Glavlit is tired of repeating that it need not be required of authors, yet everyone keeps on bringing it anyhow, even in duplicate, just to be sure. We had a detailed talk with specialists, working professionally on the problems of protecting information, on the shortcomings of the secrecy system. An abbreviated account of this conversation follows.

In our interlocutors' opinion, the problem of secrecy is ages old and complex, and not just for our country. However, it has acquired particular topicality in connection with strengthening measures of trust in international relations, the policy of glasnost and the economic reform.

Normative documents were put into effect in the early 1970s which, essentially, also define the shape of today's secrecy activity. The key element of any, including the Soviet, system for protecting secrets is the mechanism for selecting, classifying and subsequently declassifying them. Procedurally, this is implemented by compiling (and keeping up-to-date) lists of information which is a state secret, and developing departmental lists.

In addition to the regular review of such lists, declassification of the corresponding information also occurs. However, a paradoxical situation has taken shape today in which the problem of protecting secrets comes up against not so much classification as secret, as the declassification of information which is either no longer expedient to guard or for which circumstances urgently require a change in its mode of utilization.

Our existing classification and declassification mechanism is not the most successful. There are examples in world practice of rigid, forced limitation on the time periods for secrecy. Thus, a number of states have established procedures in accordance with which the level of secrecy of the protected information is reduced, right up to its declassification, after certain time intervals. However, despite its outward attractiveness, this "automatic" system incorporates an element of formalism and cannot serve as a "panacea for all ills." A procedure in which the term of effect for the legal regime of a state (or other) secret is established during classification seems more preferable. Incidentally, the existing procedure also stipulates this possibility, but it is poorly used in practice. If the same question is formulated with the required professional depth, a program- and goal-oriented approach to secrecy seems the most optimal. Then, the classification and declassification process is aimed not at formal criteria on lists, but at achieving specific goals, among which secret restrictions are introduced for a certain time period.

However, optimizing the classification and declassification procedures is only part of the problem, albeit very important. The existing practice of secrecy particularly reflects upon the system of social relations which has formed in the country. Because of this, the notorious flaws of the administrative-command system are inherent in it: the bureaucratization of procedures, the extensive nature of development, ignoring of objective economic laws, and a lack of receptivity to the needs of scientific and technical progress.

One of the main disadvantages of the system for the protection of secrets is its "non-qualitative" legal support. Essentially, we lack even strict juridical definitions of state, official and military secrets, which leads to departmentalism and lack of coordination in their interpretation and in the application of norms. The juridical imperfection of the solution to secrecy problems and the related "play it safe" approach, characteristic of many

executors, contribute to an unfounded increase in restricted information. It is becoming ever more difficult to look into the ocean of secrets and ensure their safe keeping.

Another aspect of the problem of the imperfect legal status of information is the definite alienation of existing juridical norms from present-day socioeconomic realities such as the diversity and development of all forms of socialist property, the expansion of the economic rights of state and cooperative enterprises, and the appearance of mixed-type enterprises, including those involving foreign capital. The complete "governmentalization" of the system for protecting secrets contradicts new economic legislation, not allowing enterprises to fully implement their rights to the possession, use and disposal of a resource as important as information.

Today, unfortunately, all of our secrets have state status, which hardly reflects their true nature and the real rights of the subjects of economic activity to restricted information. Secrecy is not only a legal, but also an economic category. Under the conditions of the current wave of NTR, information is the most important commodity in terms of volume and significance. Therefore, the system for protecting secrets should be not only be politically justified and legally substantiated, but also economically well-considered. Incidentally, this is done in many countries.

Unfounded secrecy has particularly negative consequences for scientific and technical progress. The combination of the interests of national security and the free exchange of scientific information is objectively contradictory. This is a very complex and dynamic process, influenced by many factors: from the state's foreign political considerations to a specific scientist's subjective considerations of prestige. In any event, secrecy in scientific and technical fields is the subject of frequent and sharp debates among scientific, business and military circles in the U.S.

In this connection, it would be interesting to discover the opinions of individual Soviet scientists, the USSR Academy of Sciences and other interested ministries and departments, for whom, apparently, it is time to switch from criticizing the secrecy system now existing in the USSR to offering constructive suggestions for its rational restructuring.

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Secrecy Policy Retarded Soviet Superconductivity Research

18140027a Moscow NTR: PROBLEMY I RESHENIYA in Russian No 15, 2-15 Aug 88 pp 6-7

[Article by V. Ozhogin, doctor of physical and mathematical sciences: "To Hold and Not Let Go." Passages in boldface as published]

[Text] **Last year NTR was the first to respond to the discovery of high-temperature superconductivity, having published a selection of materials under the title "Street Celebration for Physicists." However, not all the fruits of this palm turned out to be sweet. It caused many unpleasant moments for one of the heroes of these articles, A. Golovashkin, a researcher at the USSR Academy of Sciences Physics Institute. He was "dragged through the authorities" for a long time, since according to a then-existing resolution it was forbidden to divulge information about superconductors with a transition temperature of over 25 K. The entire world was excitedly discussing the sensational discovery, but we had made a state secret out of it. This resolution was only abolished in June, more than half a year after the appearance of the first articles on VTS [high-temperature superconductivity].**

Even today, secrecy often jams a stick in the wheels for physicists working on high-temperature superconductivity. In the opinion of the author of article presented here, V. Ozhogin, doctor of physical and mathematical sciences (Institute of Atomic Energy imeni I.V. Kurchatov), the secretive atmosphere for this field of research is unquestionably ruinous.

"The West has kept superconductivity secret!" Some specialists and scientific administrators involved with VTS have come to this conclusion. Their opinions are based on a sharp drop in the number of publications on this subject at the end of 1987. Therefore, they assumed, a considerable share of the articles did not make it into the journals.

Actually, the flow of articles on VTS, collected in the middle of last year at a rate of three per day, weakened in January to 1.5-2 per day. At that time, the military displayed an interest in the new physical effect—recently an American company announced that it is starting to design a nuclear submarine engine using superconductors. It would seem obvious: the introduction of new superconductor technology, provoking commercial and military secrecy, had begun in the West.

There is, however, another explanation for these facts which seems more reasonable. At the same time that the number of articles declined, the first stage of research had finished, in the course of which scientists had taken the first and simplest questions and had set up experiments using existing methods. Then, research was intensified, measurements required new methods, monocrystals, which are considerably more difficult to obtain than ceramics, became necessary and, naturally, the pace slowed down sharply. The fact that at the beginning of this year, after the discovery of a new type of superconducting material, bismuth and thallium ceramic, the flow of publications once again grew to its previous volume, supports this explanation. As far as the nuclear submarine is concerned, it does not seem like a subject for secrecy to me. The engine has not only military, but also general human significance—there is no sense in keeping it secret. One could just as successfully declare the technology for manufacturing the neon lamps, used on the very same submarine, a military secret.

Yet another military application of VTS is being discussed abroad. If a high-temperature superconducting accumulator of energy suddenly (on command) loses its superconducting properties, then it will explode. Some popular scientific publications are claiming that this explosion would be equivalent to an atomic explosion in terms of power. However, the reader can relax: it will still be a long time before an atomic explosion for superconductors, since for the time being the accumulator theoretically is still not even comparable to a "gasoline" bomb and there is little likelihood that it will attain this in the foreseeable future.

However, be that as it may, the opinion of supporters of the secrecy version has prevailed, and today our researchers have been granted an opportunity to experience the full severity of our own secrecy for themselves.

This severity is no small thing. Secrecy not only protects our achievements from Western special services, it erects a barrier between scientists within the country. The new in science is born through contacts between scientists and if their interaction is heavily restricted, scientific productivity sometimes drops almost to zero. On the other hand, not keeping secrets at all is also impossible, since leakages of ideas can occur, particularly in the development and introduction stage, which are economically unprofitable (more on the military aspect of the problem a bit later). For precisely this reason, a system for classifying secrets within the state has taken shape historically since ancient times. Thus, secrecy is a reaction to the possibility of a theft, a unique tax on mankind's lack of moral development.

Like any tax, secrecy ought to be optimized. When it (a tax) is too small, state interests suffer. However, when it is too large, science loses its dynamism. Moreover, the system of secrecy itself also works worse in this case, since spending funds to protect that which is commonly known means less effectively defending that which actually needs protection.

Let me immediately make a provision: it is a question here of peaceful times, because in times of war secrecy is subject to entirely different laws which have only an indirect bearing on economics and the rates of scientific development. Yet this reign of secrecy which has taken shape in our country with regard to scientific and technical information is little different from those typically used in other countries during times of war. However, it can be stopped in time! The United States, for example, first introduced the strictest secrecy for its uranium project, the likes of which previous researchers had never even dreamed of. However, today this system "of theirs" works on entirely different principles.

Thus, what must be done to adapt the existing reign of secrecy for peace-time conditions? In the first place, in my opinion, the classification and declassification procedure itself should be changed. A number of countries have eliminated commissions which, meeting after certain time intervals, decide which secrets have become outdated and which have not. This is very labor-intensive and therefore ineffective. Automatic declassification after a certain period of time must be introduced. This time period can be quite varied, depending on what is being kept secret and in what country. In England, for example, state documents are kept secret for 30 years, after which they are automatically disclosed. In Japan, an unusually dynamic country, this time period (with regard to science and technology) is somewhat shorter, only 7 years. However, another time scale parameter exists there. Recently, talking to a Japanese physicist, I asked him whether or not they are planning to convert from a hieroglyphic to an alphabetic-phonetic writing system in his country.

"Technically, we are ready for this," he answered, "however, we think that it is better to keep the hieroglyphs all the same. In the first place, this is our history. Secondly, hieroglyphs are somewhat more aesthetic than your letters, and thirdly, they give us the benefit of the odds."

"What odds?" I did not understand.

"This is the time it takes for our articles to reach foreigners. Over the half a year, while they translate our text into the English, copy the translations and send them to their own research institutions, we can read these hieroglyphs freely. Communicating among ourselves without any obstacles at all, we advance so far ahead that many data are obsolete in half a year."

It turns out that the existence itself of hieroglyphs replaces the need for secrecy. In truth, it would be opportune for us to introduce the Cyrillic alphabet, in order to stop being a society closed from itself!

There is another important change which, in my opinion, is entirely necessary. The state's license and patent policy should be such that the author himself has the right to evaluate which is more profitable for him—to publish something immediately, thus losing the right to a possible large future income or, counting on this income, to neglect his personal prestige and patent it, closing the information. However, do not forget (to paraphrase a classic): the prestige of society consists of the prestige of its members.

It is very important that nobody interfere in this process, except the author, the companies which are subsidizing his research and the editor, if he decides to publish it. If they divulge a state secret, they must answer to the law. Control over its observance must be carried out according to outputs, not according to input, as is being done today. This is much cheaper and more effective. After all, you do not go to the militia for permission to cut bread with a knife, simply because a knife is a hand weapon. If you commit a crime with this knife, they will arrest you, but you may cut bread in good health, as much as you wish.

Here, everything takes place differently. First, permission to publish the article must be obtained—it is officially registered by an act of expert examination. The article then proceeds up through the authorities, where the signatures to the act are repeatedly certified. This is an improbably long, multi-stage and utterly senseless process. For example, it takes up to 45 days in some departments.

Since VTS research is developing extraordinarily rapidly and such time periods are unacceptable here, they decided to meet specialists in this area halfway and let them to send articles, not through the usual chain, but through the USSR Academy of Science, where the permission procedure, while essentially the same, is nevertheless shorter by a factor of 3—it only takes 15 days. True, there is a small "but"—this only applies to materials published in the USSR. If the same author wants to send an article or report abroad, the 15-day procedure is added to the 45-day one, because the USSR Academy of Sciences visa is insufficient for permission to publish abroad. The delay thus increases to 60 days. At the current rate of VTS research my colleagues abroad can, in 2 months, formulate a task, create an experimental method, make measurements, study the results, write an article and publish it. Over the very same time period, we only obtain permission to publish a previously written work. After this, how can we even speak of catching up with anyone?!

This is an enormously long, death-dealing time for VTS, even if sensibly used, for the careful, scrupulous study of possible leaks of defense or commercial secrets! It is spent as the article travels from desk to desk, from floor to floor, merely to certify the first two signatures. These signatures belong to two very respected scientists who are entrusted in the USSR Academy of Sciences with the expert examination of everything concerning high-temperature superconductivity. Of course, they are very competent in their own area of direct activity—basic research. However, all they can do is to purely mechanically separate a technical article from a purely scientific one.

When I mentioned this to some very responsible people, they were surprised:

"What, have you no 'girls'? Give them the papers, let them run through the offices and in 5 days you will have the permission ready."

However, I am embarrassed to burden these so-called "girls," 80 percent of whom have adult children, with such work. Their labor should also provide a socially meaningful result. When they go through the offices to collect signatures which no one needs, I think: what is the sense of this?

I could expatiate for a long time on the harm that excessive secrecy does to science: how they classify an utterly non-secret work as secret in order to conceal its low quality from colleagues; collections of articles published under the "secret" stamp, simply because the authors did not want to take the time to officially register their works and wanted them published more rapidly (and how many readers do such publications have?); I will relate only one, in my own opinion, dramatic consequence, almost a trivial detail for our science.

Not long ago I managed to officially register the program for one all-union conference. A month or two beforehand, i.e., already fairly late by bureaucratic standards, I asked a well-known scientist to make a "guest" speech. Such a speech is a very great honor for any scientist. The first thing that he told me was: "I will not succeed in registering it." He was not interested in the subject of the report, the make-up of the audience, or why precisely he was invited instead of someone else. Above all, he thought about the confusion with paperwork. This often oppresses our scientists so much that they lose the taste for publication, particularly for rapid and topical publications. They avoid the hot points in science, because they know that they will have to spend a mass of nervous energy and effort only in order to successfully register their work. Scientists are beginning to avoid genuine (thus, up-to-date) science—what could be worse!

The problem of secrecy in science in general is complex and difficult. One resolution will not solve it—it is too deeply entrenched in our society and broaches questions which are too serious. However, those who work in high-temperature superconductivity, at least, can no longer wait until it is solved. VTS and secrecy are incompatible with each other and their contact is devastating to this science: we must directly separate them.

High-temperature superconductivity is the most dynamic of all fields of modern knowledge. Throughout the world about 400 laboratories and more than 5,000 researchers are working on what little is known in this field. There is not a single idea, scientific or technical, in this field which has not appeared simultaneously or almost simultaneously in several heads. It is not only senseless, but also useless to keep something secret: if you conceal something in the hope of future profit, military or commercial, in at most a month your secret will be known to everyone—but someone else, not you, will be named its author.

Secrecy is even more absurd for us, considering that even today the import of information to our country by far exceeds export, and without this we are deprived of fully valuable scientific dialogue. Only when the rate of research conforms to the scale of the task, when we obtain the possibility of exchanging information with each other and with foreign colleagues rapidly and without various restrictive obstacles—only then will we be able to bring our research to the world level to which Soviet intellectual potential fully corresponds.

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Lack of IBM Compatibility, Lagging Technology of Soviet PC Production Discussed

Comments on Progress of Computerization Process

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[Selection of letters and articles prepared by Yu. Meshkin, under the rubric: "NTR Discussion Club" Pasages in boldface as published]

[Text] **In NTR No 1, 1988, we published a selection of articles on the progress of the computerization process in the country and the reasons for our lag behind other countries in this area. The article by Muscovite F. Shirokov, "Do Computers Understand Each Other?," sparked particular interest. We again turned to the "Resonance" column (NTR, No 4) on this subject. Even today, we are still receiving letters. The editors have received an official response from USSR Minradioprom. As Yu.T. Semikov, main administration chief of the ministry, reports, "the response was written by V.Ya. Pykhtin, chief designer of PPEVM [professional personal computers], and was discussed with the scientific community of the Minsk Scientific Research Institute for Electronic Computers." We present it in full. We also acquainted F. Shirokov, author of the first article, with this letter, which prompted him to continue the subject after supplementing his own viewpoint with new facts which, to put it lightly, do not quite coincide with the evaluation of the existing situation given by the development workers.**

F. Shirokov's article was considered by the bureau of the Department of Information Science, Computer Equipment and Automation of the USSR Academy of Sciences.

All of this is now the subject of discussion in today's publication under our new rubric, "NTR Discussion Club," prepared by Yu. Meshkov.

One Could Not Agree More...

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[Letter to the editors by V. Pykhtin, chief designer, Minsk NII EVM: "One Could Not Agree More .."]

[Text] Software compatibility with IBM PC computers, which have actually become the standard, achieved by the developers of the YeS-1840 and YeS-1841 personal computers after sharp discussion with the devotees of other architecture solutions (DEC computers and others), is treated by Comrade Shirokov, author of the article "Do Computers Understand Each Other?," as "only software compatibility."

However, it is widely known that "computers understand each other" based primarily on architectural compatibility, which ensures the commonalty of software, both systems and applied, and not on the principle of "connection compatibility."

If one is forced to choose (proceeding from economic and time considerations), software compatibility, unquestionably, should take first priority.

Connection compatibility implies not only standardized connection on the mother board, but also the compatibility of all sorts of connectors and cables which are installed directly on all boards, that provide for the interaction of the computer with peripheral equipment.

Furthermore, hardware compatibility presumes the existence of componentry comparable in terms of scale of integration, but the creation of an Intel-80386 type microprocessor, on the basis of which the higher-end models of the PS/2 family are implemented, is problematical because of the already-mentioned lag of domestic technology at the present time.

In confirmation of the dependence of the possibility and justifiability of hardware compatibility on componentry, we shall cite the example of the same IBM company, which has used a new connector in its new family of PS/2 personal computers, thus "violating" connection compatibility with its own preceding models.

Thus, the YeS-1840 personal computer—mass produced since the beginning of 1986—and the YeS-1841—mass produced since the end of 1987—have an architecture, open for expansion, and ensure software compatibility and the compatibility of magnetic storage devices with IBM computers. Software compatibility makes it possible to utilize the entire wealth of software products which have already been made, without additional adaptation. Magnetic storage compatibility makes it possible to use IBM format floppy disks, which have practically become the world standard.

On the subject of achieving conformity with the "new industrial standard" (the PS/2 family), this is possible by creating an Intel-80386 type microprocessor and the corresponding support environment for it, but not at all only by developing "PS/2 connection compatible" personal computers.

However, there are a number of fundamental problems, having a historical alternative, in the way of implementing design compatibility: in particular, the country does not have normative and technical documentation in use for the inch system, but the metric system is used, etc.

Naturally, one could not agree more with Comrade Shirokov's opinion that the level of compatibility of domestic personal computers would be greater if design compatibility had also been implemented.

Why Be Tricky?

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[Article by F. Shirokov, candidate of physical and mathematical sciences]

[Text] Connection compatibility is a key factor in the entire production of personal computers. A new computer term has recently appeared, borrowed from biology—cloning, i.e., the creation of a genetically identical organism. "Computer cloning" is the creation of a connection-compatible machine, which entails more than the simple mechanical compatibility of the boards. The problem here is not reduced to the simple physical capability of taking a board out of one machine and installing it in another. Connection compatibility is the complete mechanical, electrical and information compatibility of the boards, of the outputs for peripheral devices, etc. Connection compatibility is compatibility with everything, right down to the connectors, not just the compatibility of connectors. It implies architectural compatibility, but not vice versa. Not only is it possible to transfer a board, but the board will operate in a "strange" machine just the same as in its "own."

The largest producer of computers which clone the IBM PC is the American company Compaq (approximately 600,000 computers annually). There are dozens of other, smaller (in terms of cloning) companies. After IBM, the world's second largest producer of computer equipment is the DEC Corporation, which put out the "Rainbow" personal computer, which is software compatible but does not clone the IBM PC, several years ago. The DEC Corporation was forced to halt production of the "Rainbow" and produce the cloned "DEC-Mate" computer. Such is the strength of a market economy.

In the article "Do Computers Understand Each Other?" it was asserted that throughout the world IBM PC connection compatible computers are being produced, but the YeS-1840 computer is connection incompatible. For example, a user who has purchased a Taiwanese computer has the guarantee that a graphics board, for instance the "Hercules," will work in his computer. It will also work in a "Great Wall" personal computer (PRC) and in a "Pravets-16" computer (Bulgaria), but it will not work in the YeS-1840 computer created by NII EVM (Minsk). It will not work because it is impossible to put it in a YeS-1840. The YeS-1840 has different board sizes, the board componentry is different and it has a different electrical information "lay-out." This fact is impossible to explain, as V.Ya. Pykhtin attempts, by references to the metric system being used in the USSR.

Let us note that the YeS-1840/41 computers are built using imported (Taiwan, India, Japan) storage units. These units use the "inch system." The first floppy disks, developed by the very same IBM Corporation, appeared in the early 1970s. Originally, they were 8-inch disks (203.2 mm). Our industry produced the GMD-70 storage units (in small series and of very poor quality!) in precisely this format.

In the late 1970s, 8-inch floppy disks were replaced by 5.25-inch diameter disks (5.25 inches = 133.09 mm). The YeS-1840/41 are built using precisely these imported storage units (Indian, Taiwanese, and so on). Whether we like it or not, if our industry at some time or another begins the mass or series production of flexible disk units, these units will conform to the "inch format."

Abroad, the total production of 5.25-inch floppy disk storage units has reached millions of units annually. All of them are primarily used in personal computers. Moreover, the concept of the 5.25-inch form-factor has arisen. Winchester units, streamer tape units (half-and quarter-inch width) and optical disk units have begun being implemented in conformity with this form-factor. It is mechanically convenient, since it is possible to install any device in one and the same socket, in one and the same slots. If our industry once again begins to produce "Winchesters," streamer tape units and optical storage units for personal computers, they will be implemented on the same "inch" form-factor.

Inch measurements are used for computers not only as applied to storage units. They are also used in integrated circuits and printed circuit boards. The spacing between its contact leads—the "legs"—is one-tenth of an inch (2.54 mm) throughout the world, except in our country. Here, this figure has been rounded to 2.5 mm (apparently, for convenience). If a circuit has 10 legs per side, then there is a difference of 0.4 mm between a domestic integrated circuit and an "international" one, and with 20 "legs" an inability to connect of almost a millimeter occurs. It is entirely obvious that we will never—neither now nor in the 21st century—be able to coordinate our "rounded-off" GOSTs with the leading computer countries. Would it not be worthwhile to convert to that which is generally accepted?!

V.Ya. Pykhtin claims that supposedly all software which works in an IBM PC will work on the YeS-1840/41, regardless of connection compatibility. This is not so at all! Let us consider everything in succession.

According to the technical specifications, the YeS-1840/41 computers ought to be software compatible with the IBM PC/XT. The K1810VM86 domestic microprocessors, on which they are implemented, in principle allow such compatibility. However, no communications packages whatsoever for the IBM PC/XT work on our YeS-1840/41 computers. They do not work because the interface to the peripheral devices, the so-called "Styk-2," does not meet the RS-232C world standard. It is connection incompatible.

Furthermore, the imported floppy disk units used by the YeS-1840/41 computers, as opposed to units for the IBM

PC, have 80 tracks (and not 40), and information is written to it through one track. This has two consequences. Firstly, half of the capacity (scarce and imported!) of the diskette is not used. Secondly, diskettes written on the YeS-1840 are read poorly on an IBM PC. The possibility of carrying out a normal program exchange is broken. However, this is not yet all!

In computer business, 1986 was named the "year of the mouse." A "mouse" is a small device which is held in one's palm. By moving it along a table, it is possible to control the cursor on the screen, indicate the necessary areas and perform necessary operations. A "mouse" is used, for example, in computerized drawing systems. Using it, one selects a "brush" and "color" and makes the desired lines. Drawing systems are used to teach children, for industrial drafting and for the most diverse applied tasks.

The YeS-1841 computer has a fairly large main memory (1-1.5 megabytes) and a "mouse." However, the K1810VM86 microprocessor addresses only half a megabyte of memory directly. It addresses the rest of the memory through a so-called "page exchange." The implementation of the "mouse" and "page exchange" in the YeS-1841 differs from their implementation in the IBM PC, and many programs directly intended for a "mouse" do not work on the YeS-1841.

This, in fact, is how the supposedly achieved "software compatibility" looks.

The article "Do Computers Understand Each Other?" dealt with only one area of the development of domestic IBM PC "compatible" computers. Actually, three organizations make claims of "compatibility:" Minradioprom (YeS-1840/41); Minpribor (Iskra-1030); and Minpromsvyazi ("Neyron").

We shall not dwell on all of the details of "competition." Let us note only that all three computers are hardware incompatible among themselves. It is impossible, for example, to remove a board from a "Neyron" and install it in a YeS-1840, and vice versa. This incompatibility is multifaceted. The display adapters of the "Iskra" and the YeS-1840 are incompatible. The floppy disk units for the "Iskra-1030" are produced in the GDR, but the formats for writing to them are essentially incompatible to those in the YeS-1840, etc., etc.

If someone happens to "luck out" and be standing next to a YeS-1840 and an Iskra-1030, he would essentially have to acquire two software supplies, a separate one for each of these computers. On the whole, we are referring here to "separate production," which leads, to put it bluntly, to the tripling of all development outlays.

It is well known that IBM PC computers use the standard EGA graphics card—an enhanced graphics adapter. Its analog is manufactured for the YeS-1841, yet independent development will be needed (with separate financing) for the Iskra-1030 and the "Neyron."

Today, the YeS-1842 computer is being readied for state acceptance, which should be compatible with the "high-end" of the old IBM series, i.e., with the IBM PC/AT. However, the IBM PC/AT is built using the "intermediate" Intel-286 microprocessor, not the "junior" Intel-88. At this time there is no domestic analog to this microprocessor and it is not visible "on the horizon." A legitimate question arises: what kind of "technical decisions" will be made in implementing the YeS-1842? In what real sense will it be compatible to the IBM PC/AT? If an attempt is made to make up for hardware imperfections using software, then monstrous confusion arises in software compatibility and incompatibility.

As is well known, the IBM Corporation has been producing a new series of computers, the PS/2, since April 1987. At the present time, models 25, 30, 50, 60 and 80 have been produced. The highest of them, the model-80, was designed on the basis of the "Intel-386" 32-bit microprocessor with a performance of 4 million instructions per second, and its performance in terms of "expensive" floating point operations is 1.5 million instructions per second. Thus, the model-80 surpasses our most productive computer for scientific and technical computations—the BESM-6.

The Intel Corporation has announced that it is developing the new Intel-486 microprocessor. It will be supplied to customers in 1989, and by 1990 new personal computers will be designed on its basis. Today, many United States companies are already competing to create personal super-computers, machines with a performance of up to 100 million operations per second. Such computers, in particular, provide the engineer with the means for physically modeling the items he designs. This year, the "Stellar" and "Advent" corporations are producing graphics work stations for the U.S. market with a productivity of 20-60 million operations per second. This will be a new leap forward in the development of the entire industrial system.

The road which our "compatible" personal computers are taking today leads nowhere. The computers which are being produced can only discredit the idea of computerization. In order to correct the situation, complete glasnost in everything involving personal computers, their present and their future, is necessary. We must publish and discuss the technical tasks for new personal computers and give the most detailed information about the microprocessors on which they will be implemented; organize permanent (intersectorial!) product selection offices in all large cities, accessible to anyone "off the street;" organize the competitive design of microprocessors and made-to-order integrated circuits; and create an organization of users, independent of producers, which evaluates the quality of said personal computers.

If these or similar measures are not introduced, if the developers and producers "obscure" as before, and the ministries and departments continue to guard the regimental honor, if society does not even know the last

names of those responsible for the state acceptance of new computers, then, in mass producing 100,000 such computers per year at a cost of 10,000 rubles apiece, billions of rubles will be blown away on the wind.

Lagging Production Technology

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[Letter to the editors by M. Kuzmin, candidate of physical and mathematical sciences, senior scientific associate: "Sideways Steps"]

[Text] I consider it my personal duty to support the articles in LG and NTR regarding the serious personal computer situation. The ministries and departments responsible for the production of computer equipment are, undoubtedly, trying to soften the evaluations which were expressed, relate their achievements and, as usual, promise to correct the situation in the shortest possible time. Do not believe them! All of the evaluations are accurate: yes, it is truly a catastrophe, a truly tragic situation. All of the problems mentioned in the articles are real and serious. This is the unanimous opinion of the opposite side—the users of computer equipment. For many years I have carefully followed the state of affairs in the world computer equipment market, while helping a number of organizations purchase computers. I can bear witness to the fact that over the last 2-3 years, in which time the word "computerization" has appeared in our newspapers so frequently, the real situation in our country has continued to worsen and our lag has noticeably increased. This is primarily due to the rapid progress of world electronics. In this time period, the new generation of microprocessors (32-bit), the performance of which exceeds that of our "big" computer, has become wide-spread. For $4,000 it is possible to buy a personal computer that performs 10 million operations per second—this was the level for the end of 1987. And what have we done? We have moved, but very slowly and not forward, but rather to the side. Each department is moving in its own direction.

Three independent groups have developed a domestic version of a professional personal computer, compatible with the generally-accepted IBM PC standard. These computers are being produced by hundreds of companies in virtually every country in the world. The level of standardization here is so great that in many cases computers are assembled at home out using standard components which are sent to the customer in the mail. In this regard, the flourishing companies consist of only a few people. However, our "experts" have managed to achieve the virtually impossible: the computers developed by them (the YeS-1840, Iskra-1030 and the Neyron I-9) are not only incompatible with the international standard, but also among themselves.

Do not forget that these computers copy the 1981 model IBM—this is now not even the last, but the before-the-last generation of personal computers (the last generation is the PC/AT line, today's is the PS/2). Regardless of the fact that there has been talk of developing such models for several years, their production has still not been started up. Mass production is constantly being put off for the indefinite future. Meanwhile, given the country's need for many million units, they are trying to soothe us with victorious reports on "the mastery of the production of personal computers" (Iskra-1030, Kursk), in which they speak of producing 1.5 (!) units per day (reported by All-Union Radio in 1987). Thus, we have no personal computers and, unfortunately, there are no visible prospects for improving the situation. At the least, it hardly makes sense to continue in the same direction, trying to master poor copies of obsolete computers. We are too far behind to make something of our own. Therefore, it is necessary precisely to copy, but to do it more quickly and more precisely, in critical cases most likely using licenses from foreign companies which specialize in this field.

Meanwhile, the only thing that those comrades responsible for computers in our country have been successful in is in creating artificial barriers in the path to their import—not only for personal use, but also for organizations. Yet, the most amazing thing is that insuperable obstacles also block the path to making purchases in the socialist countries.

Our lag in the production of computer equipment is enormous, but right now even this is not the main problem: the technical level of our entire industry is inadequate for the mass production of personal computers. Their mass application in management, at work and in industry—throughout the world, the overwhelming majority of this equipment is used precisely in these areas—can only do harm if we do not qualitatively, many times over, increase the reliability of all components and computers in general and if we do not create a maintenance service network.

Economic Sore Point

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[Article by Ye. Velikhov, academician, secretary of the USSR Academy of Sciences Department of Information Sciences, Computer Equipment and Automation]

[Text] The problems raised in F. Shirokov's article "Do Computers Understand Each Other?," regardless of the seemingly partial nature, touch upon one of the sorest points of the country's economic development. Its contemporary stage ought to be distinguished by high mobility, the frequently priority nature of practical decisions and the possibility of flexibly disposing of resources at an inter-sectorial level. Decisions ought to be made on the

basis of well-prepared forecasting information (incidentally, G. Gromov's article in the same issue of NTR, essentially correct, concerned this).

The lack of these mechanisms, as well as of a number of other circumstances, which is being talked about a great deal lately, has led to the fact that our research and, primarily, industry has considerably lagged behind the leading countries of the world in the field of microelectronics. V.Ya. Pykhtin builds his explanation on this, which is correct, but the problem of domestic personal computers is considerably more complex and is not exhausted by hardware compatibility.

There is no doubt that domestic personal computers should be built on the basis of international standards. This is now obvious. Bringing production up to an international standard is another matter. This takes time. Halting the conveyer today means setting the production of the computers needed by the country back several more years.

For the first time, while industry is assimilating new technology and converting to international standards, we will compensate for the lag of domestic computers conforming to the current world level by producing them in joint companies with Western countries and through cooperation with the socialist countries.

Research, aimed at creating new generations of personal computers which, we hope, will make it possible for us to draw closer to the rates of computer equipment development which exist in the world, is being conducted in parallel by institutes of the USSR and Union republic academies of sciences and of the ministries of instrument building, the electronics industry, the radio industry and the communications devices industry.

13362

Statistics on Soviet Lag in Information Science Given

18140322 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 12, 21 Jun-4 Jul 88 p 4

[Article by A.I. Rakitov, professor, doctor of philosophical sciences: "The Problem of Problems." Passage in boldface as published]

[Text] **A society which has a chronic shortage of information is doomed to lag. The processes of democratization within it are hindered, glasnost, unsupported by reliable, complete and unrestricted information, can be easily converted into ordinary demagogy, and industry and management remind us of a chained giant. This is why A.I. Rakitov, professor, doctor of philosophical sciences, thinks that the creation of a developed information society should become one of the high-priority areas of restructuring.**

In ancient Greece, approximately one 100,000-strong segment of the population worked out all of the knowledge needed in order to develop production. Today, in order to increase production by a factor of 2, the amount of knowledge must increase by a factor of 4; to increase production by a factor of 10, the amount of knowledge should grow by a factor of 100. Material production has become incredibly complicated: in order to solve the problems which are arising in it, information must be produced more rapidly than material products by factors of ten, and then even by factors of hundreds.

In a historical competition, that socioeconomic system will win which knows how to produce information of the best quality, in the greatest volume and which uses it effectively. Today, the U.S. holds first place in this regard. It is followed by Japan, the West European countries, and only then by the Soviet Union.

It has been calculated that in order to meet information needs by the year 2000 all of mankind would have to become scientists and engineers. This is obviously impossible. What is the solution? It is well known. Information technology, including modern computers and their software and communications systems, must be developed on a gigantic scale.

In this regard, we are also not standing idle. However, imagine an elevator, rising with slight acceleration along a deep shaft, the edge of which is being raised ten times more rapidly than the elevator is moving. Then, regardless of its movement, the distance from the edge of the shaft does not decrease, but increases, and the passengers never see the light of day. In terms of our subject, one could say that the information level of the elevator passengers is constantly decreasing relative to those who are located at the top of the shaft. In a world of information abundance, they are doomed to information hunger. Despite every desire to know more, to work better, to know how to plan and forecast their own lives, they are doomed to chronic incompetence. They must take most decisive steps to radically change the situation before it is too late. However, in order to do this they must know their own resources, their own possibilities: they must know the distance between them and the edge of the shaft. In other words, they must look the truth in the eyes without false emotions and realize the true state of affairs.

This is particularly important now, on the threshold of the party conference, on which the fate of restructuring, including the restructuring of our economy and of the information technology which is the core and the main catalyst for all scientific and technical progress, will depend in many ways. Generally-accessible electronic data and knowledge banks are the mechanism for collecting, distributing, processing and even for creating new information. There were 3,300 such banks in the United States in 1987. We have practically none, although there are specialized banks accessible to a limited number of specialists.

Meanwhile, it is precisely the generally accessible knowledge which stimulates mass creativity and accelerated economic development. Anybody from anywhere in the country ought to have unlimited access to the knowledge and facts stored in electronic banks. Without this, information dystrophy sets in. Information is replaced with disinformation and democracy and glasnost are turned into a farce. Creative initiative is doomed to repeat what was done before, and society is forced to feed itself with the information leftovers from a stranger's table.

In order to keep this from happening, mass production and distribution of personal computers, which have already become a consumer product in the West, must be set up. There are already more than 35 million of them in the United States, while we have fewer by a factor of 300, according to estimated calculations. Fifty percent of American families own a personal computer, sometimes more than one. We have only a handful of such families. However, even having a personal computer is like having a faucet without plumbing: for the time being there are no integrated communication systems in the country which could join them into a single network, linked to data banks, trade and transport enterprises, hospitals, cultural institutions and schools.

Such a network has already been created in the United States. The West European countries will complete the creation of theirs in 1990. We have not even started to build one. How could it be otherwise? After all, we have fewer telephones per thousand people than Great Britain by a factor of 4, than the United States by a factor of 5, and than Sweden by a factor of 6. We are not even planning to create a cable television communication system. Cable communications became profitable in the United States literally in 3 years. Half of U.S. televisions are connected to it. Without leaving the house, one can use it to shop, make financial calculations, obtain necessary medical, household, pedagogical and other information and to develop cottage industry.

Unquestionably, however, software is the heart of informatization. In 1986 the value of software production in the United States amounted to 40 billion dollars. According to indirect estimates, we have less by a factor of hundreds. Programmers are one of the most highly-paid specialists in the United States. Here, according to statistical data, the average monthly wage of a bulldozer operator is 467 rubles, of a seamstress—240, a scientific worker—208, and an information worker—158 rubles.

However, perhaps under conditions of a "universal" shortage we ought to start precisely with the material production sphere: agriculture, machine-building, etc.? Such a view is engendered by our customary industrial economy, which has been stagnating for a long time. The world is already moving toward an information economy, a knowledge economy.

In fact, how can we even discuss economic restructuring if enterprise leaders, engineers, cooperative members, etc., cannot instantaneously and completely obtain information about work force availability, demand for goods, the market for finished products and raw materials, technical innovations in all countries of the world, the most promising scientific and engineering developments, and the prices, standards and documentation for international and domestic markets?

Not to mention that the development of cottage industry, cooperatives, and national education completely depends on successes in the informatization of our society.

Informatization, i.e., conversion to an information society, is a very complex process. It also changes the social structure of society. In the United States 67 percent of workers are employed in the services and information sector, approximately 25 percent—in industry, and 2.8 percent—in agriculture. Here, correspondingly, in the first category there are only 30 percent, in the second—slightly over 50 percent, and in the third—the remaining segment of the able-bodied population. The potential for changes is tremendous.

I will now note that when we started industrialization in 1927 we lagged behind the leading capitalist countries by a factor of 6-8. Today, starting informatization, according to basic indicators we are lagging by factors of hundreds, sometimes of thousands. Our information production is virtually nonexistent on the world markets, although it is more profitable than traditional goods, as is obvious from the following: 1 kilogram of automobile is more expensive than 1 kilogram of steel by a factor of about 100, a kilogram of airplane—by a factor of 7,000, but 1 kilogram of silicon microcircuit is more expensive by a factor of 70,000. The sale of expert systems by U.S. companies in 1986 was estimated at 300 million dollars, in East European countries—150 million dollars, and will correspondingly consist of 3 and 1.5 billion dollars in 1990. Not only do we not sell commercial expert systems, but we almost do not create them.

In computer production we lag not only quantitatively but also qualitatively: our personal computers are the poorest in the world. In the United States personal computers capable of several million operations per second are already being produced. We make far less powerful equipment, "stolen" from Western 1980-1981 models, and are planning to produce models which are being taken out of production in other countries. It is impossible to reconcile oneself to such a situation.

Meanwhile, informatization enhances our understanding of the world, makes it possible to assimilate diverse information a hundredfold more rapidly and increases our individual creative capabilities. It provides a technological means for overcoming bureaucratism. After all, the paper mass of several hundred million documents produced daily by our bureaucratic system can only be neutralized and reduced using electronic equipment, computers and integrated communications. World

experience indicates that informatization halts the growth of bureaucratism and makes its middle links simply unnecessary.

This is why the 19th Party Conference, in my firm conviction, should make the problem of the informatization of society the first priority in the system of socioeconomic preferences. It should not simply be considered one of the development trends, but a super-priority key trend, without which we will not overcome the lag, will not create a knowledge economy, will not preserve our place as a great power, will not ensure a deserved place in solving global problems and will not overcome stagnation phenomena in the economy. Therefore, we must work out a breakthrough strategy, in several directions. Above all, we must begin to create generally accessible knowledge and data bases, to develop integrated communications systems and to set up mass production of modern computers, extensively involving (I would say, under any conditions) foreign firms.

All of this will be repaid a hundredfold. If we give our people reliable modern computers, open access to all necessary information, and if we let them derive the benefit and profit from it, there will be no shortage of funds. True, we must overcome yet another great barrier in order to do this: the philosophy of secrecy, thanks to which we frequently hide technical, everyday, transport, medical, economic and other information not so much from our enemies, mystical spies and saboteurs, as much as from ourselves. Essentially, we are throwing to the winds our most valuable property—information, the spiritual achievements of our scientists and engineers, who, aging, are being deprived of value. Instead of being useful to our people and to society, we only increase the arbitrariness of our engineering and scientific bureaucrats, who are building their own well-being on the country's lag and on the inadequate level of information for the specialists, the higher echelons of power and the entire population. It is impossible to carry out restructuring, without restructuring the information sphere, without creating a knowledge economy, without converting into an information society.

13362

Opposing Views on Exclusive Right to Inventions

Right of Inventor

18140273 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 7, 5-18 Apr 88 pp 4-5

[Article by inventors N. Knyazev and Yu. Polinov under the rubric "Points of View": "Protect the Primary Right of the Inventor. The Patent Is the Only Protective Document for Inventions"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] The drawing up of the draft of the Law on Inventions is continuing. They are awaiting the results with the hope that the newly introduced statutes will become a legal catalyst of scientific and technical progress in the country. For this it is necessary not last of all to decide: Who is to own an invention and to manage its introduction responsibly? Two opinions have formed on this question. The first is: the exclusive right to an invention and its introduction should belong not to the enterprise (organization), but to the inventor alone. The second is the opposite. Today our authors, relying on extensive material of the history of Soviet invention law and facts of today, present two points of view.

The community, especially the inventing community, has received an opportunity to familiarize itself in detail with our approach to this question. In the past year we have made statements both in the newspaper SOTSIALISTICHESKAYA INDUSTRIYA and in the journal IZOBRETATEL I RATSIONALIZATOR, and recent on "The Searchlight of Restructuring" of Central Television. Therefore, let us now state just briefly our already well-known aims, having also dwelt on several of our new suggestions.

We insist that the new Law on Inventions should be based on three key, inseparably connected principles:

—the exclusive right of the inventor to the introduction of an invention;

—the right of the real inventor to authorship;

—the right of the inventor and the enterprise, which first introduced the invention in industry, to the receipt of the maximum percentage of the profit from the sale of a commodity, which has been made on the basis of the invention.

These principles come from the fact that the holdup in the section "from the idea to the machine" has become the most intolerable phenomenon. It is possible to overcome it only by having granted precisely the inventor the right to the introduction of an invention in industry. The violation of this right of the person, who is most interested in scientific and technical progress, should be punished in accordance with the law. And this is understandable, precisely the state and society are vitally interested in seeing to it that the process of bringing an inventor's idea up to the successful sale of a commodity, which has been made on the basis of the invention, would be as short as possible. And in addition: I thought, who is to do this, except for me!

The exclusive right to an invention was granted to the inventor since the very moment, when the foundations of Soviet legislation on this question were laid—since 30 June 1919. Precisely at that time V.I. Lenin signed the first legal act on this level—"The Statute of the Council of People's Commissars on Inventions." Although in Lenin's decree this document is also called "The Author's Certificate," the legal essence, which was expressed in the first three paragraphs, completely coincided with the legal essence of the patent.

In 1931 this Leninist principle and the "Patent Law" of 1924, in which Vladimir Ilich developed this principle, were repealed. "The Statute on Inventions and Technical Improvements," which was put into effect at that time, granted the state the exclusive right to an invention. And in the area of invention the principle of anarchy triumphed.

We do not want to be unsupported by evidence, let us examine briefly the legal situation that has formed since then. If the owner of a thing (an invention) is the state, there is no subject of the law. There is legal entity as such. But if a thing (an invention) is lost to the detriment of the state, which is not a legal entity, there is no one to hold responsible. There is no one to judge....

Is it not due to this that the harm from the inventions, which have been wasted within the country in vain, comes already to tens, if not hundreds of billions of rubles, or else dollars? In practice these sums are equal to the profit that foreign firms, which use our inventions earlier than us, derive.

We are convinced that this harm is due to the fact that since 1931 the inventor has been removed from invention as its real manager, the most reliable proprietor. A proprietor of a special kind. For he is not simply the owner. He is the creator of the most precious part of national property for scientific and technical progress. It is he who is at the starting point—at the very source of scientific and technical progress. He, as they say, "holds the cards."

In our opinion, the procedure of granting the right to an invention to the enterprise, and first of all to the one at which the inventor himself works, which originated in the same year of 1931, proves to be even more wasteful. Hence all the urgency of the problem of what is called "the job-related invention."

Inasmuch as the task of assimilating an invention is worked on at various levels (from the worker to the chief engineer and the director), implementation becomes

dependent on superiors. And they acquire the opportunity to hinder the introduction of the invention of an inferior, doing harm, in the end, to the state.

Given such a turn the struggle of ideas is replaced by the struggle of people. Very often not state interest, but the right of whoever is stronger administratively gains the upper hand. In this case the inventor does not have the opportunity to conclude a contract for the use of his development with another enterprise, the invention once again is in vain. Moreover, the loading of production capacities and the maximum intensity of plan assignments more often draw out the time of the assimilation of inventions up to the obsolescence of the innovative solutions. In general, by having the right of ownership of an invention, an enterprise can at any moment halt its assimilation. Again there is a loss. If the enterprise in a resourceful manner, in the shortest possible time does assimilate an innovation, it does not receive compensation for the incurred expenses and an advantage as the patent holder. Hence, there are not stimuli for surmounting the obstacles listed here to the implementation of inventors' ideas. The factors, which hinder scientific and technical progress, operate freely.

And, finally, under the conditions of a "job-related invention" the spiritual element of production, what it is now customary to call the "human factor," suffers. For all the advantages, as was observed by K. Marx, in such a case are usurped by those who have not applied personal efforts to it and got it entirely by chance. (See the works of K. Marx and F. Engels, Vol 1, pp 554-555.)

The urgent need has arisen to overcome all the factors of hindrance in inventing and to activate this, it can be said, initial type of creativity for scientific and technical progress in the country. This is why we are also advancing the proposal to include in the draft of the new law three paragraphs, which we are formulating for the first time for publication:

1. To leave in the Law on Inventions one protective document for an invention—the patent, and to grant the exclusive right to an invention to the inventor alone, having eliminated the author's certificate and the patent of the enterprise.

2. The law should be one of direct effect, and for this it is necessary to introduce in it rights, duties, and sanctions for specific legal entities: the inventor, the enterprise (in the person of the first director), the organization (with the same personification), the patent department, the State Bank, and the court.

3. A financial mechanism of the speeding up of the assimilat on of inventions in the form of a higher percentage of deductions from the profit, which is created by inventions for the enterprise, which is the first user, for inventors, and without fail for all the participants in the process of its assimilation, should be introduced in the Law on Inventions.

Why for all without fail? The introduction of such a legal norm is necessary. It stimulates everyone, who is to make a decision on an invention, everyone, who is to assimilate it at the design, experimental, and production stages. And another thing: this to a certain extent, obviously, will alleviate the most painful problem of the imposition of unlawful joint authorship on an invention.

It is characteristic that the principles, which have been proposed by us for the formulation of the new law, also received a positive response at the Institute of Marxism-Leninism attached to the CPSU Central Committee, specifically from Doctor of Economic Sciences V.V. Vygodskiy.[1]

In general we cannot complain that we are not being heard. Moreover, no one is disagreeing with us. But, what is amazing, no one is inviting us to take a direct part in the drawing up of the draft of the law.

Footnote

1. As was reported to us at the Institute of Marxism-Leninism, the personal opinion of Comrade V.V. Vygodskiy is not the point of view of the institute—Editor.

Right of Enterprises

18140273 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 7, 5-18 Apr 88 pp 4-5

[Article by Candidate of Juridical Sciences I. Orkis, the VNIIZPRANT of the USSR State Committee for Science and Technology, under the rubric "Points of View": "A Clear Outline of Legal Protection. On the Question of the Optimum Force of the Author's Certificate for Inventions"]

[Text] For a year now the conception of the necessity of the patent protection of the rights of an inventor to an invention has been disseminated in the mass media. Its authors in passing promote their own version of the origin of Soviet legislation on this question. No one is hindering them, which is entirely legitimate under the conditions of democratization and glasnost.

But the fact that all this time not one competent specialist in the theory of invention law has publicly revealed the essence of if only the historical part of the mentioned conception, is directly at variance with the very spirit of the moment which our society is going through. For this is a time of the resolute removal of the slightest distortions of the historical truth.

1.

In their constructs the authors of the version in question start off from the Decree of the RSFSR Council of

People's Commissars "On Inventions (Regulations)" of 30 June 1919. V.I. Lenin, as well as V.D. Bonch-Bruyevich and L.A. Fotiyeva signed it. This is the correct reference point.

However, to take this decree as the legal basis for the attachment to Soviet inventors of the exclusive right to their own invention means in principle to depart from the spirit and letter of the document. It is not difficult to establish this. True, one cannot do here without more or less detailed quotation.

Thus, Article 1 of the 1919 decree: "Any invention, which has been deemed useful by the Committee for Inventions, can be by decree of the Presidium of the Supreme Council of the National Economy declared the property of the Russian Socialist Federated Soviet Republic."

Even given the richest imagination here it is impossible to see anything except the proclamation of the basic principle concerning the state, and anything that speaks of the granting to the inventor of the right to own an invention.

But what is specified in Article 2? We read: "Inventions (with the exception of secret ones), which have been declared the property of the Russian Socialist Federated Soviet Republic, upon publication of this enter the general use of all citizens and institutions on special terms, which in each individual case are stipulated...."

This article also proceeds from the recognition of inventions as the property of the state, and not on the terms of nationalization, but on contractual terms, which afford the state and the individual the possibility of the purposeful use of the results of inventors' creativity.

However, let us continue the reading of Article 2: "...Inventions, which have been declared the property of the state, pertain to state defense, or are especially important for Russia and have therefore been recognized by the proper people's commissariat as particularly secret, are not liable to patenting abroad, transfer to third parties, or disclosure in general. Those guilty of violating this are liable to prosecution in accordance with the law."

This article already eliminates completely a wide range of inventions from the sphere of unrestricted use even for state enterprises, not to mention individual inventors. I will stress that patenting in this case is mentioned as completely inapplicable to inventions of this type. And, whereas Articles 1 and 2 divided inventions into universally applicable ones and ones of strictly limited application, Article 3 settles completely the question of the exclusive right to an invention.

Here is how: "Inventions, which have been recognized as useful, are declared the property of the Russian Socialist Federated Soviet Republic either by agreement with the inventor or in case of a nonexisting agreement by force for a special reward, which is not liable to taxation."

As we see, the decree in no uncertain terms asserted the priority of the state right to the use of inventions. A compulsory procedure of its observance was even introduced. However, there is also Lenin's concern for the interest of inventors—in the form of an agreement on the reward and the granting of tax breaks.

And, finally, Article 4: "The copyright to an invention is reserved for the inventor and is certified by the author's certificate, which is issued to the inventor by the Committee for Inventions."

Here V.I. Lenin (and he was strict toward definitions and wordings) named the protective document—"Author's Certificate." At that time it was also introduced for the first time in invention law. It was introduced, as we see, not at all to protect the right of the inventor to use the invention, but merely to certify its authorship, technical novelty, and priority, as well as the fact of registration in the RSFSR, which gives grounds for the recognition of the invention as the property of the Federation (state).

2.

In the same year of 1919, "The General Instructions of the Committee for Inventions on the Decree of the RSFSR Council of People's Commissars 'On Inventions'" were issued. A paragraph, which grants people, who wish to receive a reward for their invention or assistance in its implementation, the opportunity to address the appropriate application to the Committee, was inserted in it.

All these statutes, as is known to every specialist in invention law, in principle are different from the legal regime of patent protection—they are opposite to it. Owing precisely to such an aim, the 1919 decree did not grant the inventor the right to sell licenses, as well as to organize industrial use. But for the newly introduced protective document—the author's certificate—it did not require the payment of an application and annual duty and also did not establish a term of effect of 15 and 20 years, during which patents are in effect throughout the world. In short, Lenin's first decree clearly affirmed the nonpatent form of protection of inventions and the rights of the inventor.

3.

The advocates of the opposite interpretation, taking what is desirable for what is real, assert that in "The Law on Patents" (which was signed by M. Kalinin and A. Enukidze) V.I. Lenin developed the patent principle which was obstenibly incorporated by him in the 1919 decree that was just examined here.

The truth, however, is that Vladimir Ilich simply could not have had time for the Law of 1924.

Thus, you would not call the clear outline of Lenin's stand on the question of the protection of the rights of the inventor as anything but a nonpatent outline. And this procedure has been in effect in our country from 1919 to the present.

And, hence, for the establishment of a nonpatent procedure there was also nothing to repeal in 1931. That year, too, no new, as the advocates of the patent concept call it, "principle of anarchy in the field of invention" was firmly established.

From where does this affected dramatization come? I do not want to believe that it is the fruit of intentional falsification. Rather, it is a matter of something else.

Among the advocates of this strange version there are probably many capable inventors. It is hard to doubt that here they drained to the bottom the bitter cut of deceleration, which intensified to the utmost in invention as well during the "stagnant years." It is quite natural that those who were faced with all this were acutely anxious about overcoming the formed situation.

But a subjective approach is putting them in a spot. In other words, the looking at the past through the prism of personally experienced difficulties. But the more dramatic they are, the more thickly emotions that have run high usually veil rational thinking. The matter here is not limited to the distortion of just historical notions. The view of the future is also distorted.

But when they attempt to build a positive program on such unstable soil, this inevitably leads to two consequences. Either proposals, which are ill-considered in the practical respect, are advanced or they attempt to break open...wide open doors. The authors of the "three key, inseparably connected principles," which, they say, it is necessary to incorporate in the new law, behave exactly that way.

4.

The first thing, on which they insist, is the exclusive right of the inventor to introduce an invention. But did it really not occur to them that the introduction of an advanced, more or less significant invention is not the children's game of "Do It Yourself"? Design bureaus, laboratories, and test stands, and then testing grounds, raw materials, components, assembly shops and production lines, engineering services, and workers are needed. Under the conditions, which formed during the stagnant years, we find with exceedingly great difficulty managers, who have all the listed resources and to whom it would be possible to assign responsibility for introduction. But here the inventors themselves, who have just technical ideas, aspire to the right to introduce with their own hands.... Well, assume that they gave them it. From where will the practical opportunity to introduce come?

They also insist that the right of the real inventor to authorship is required. It was also established by Article 4 of the 1919 decree and, I will repeat, was never revoked by anyone. It is being observed not in the best manner—what is true is true. But this problem is not a legislative one, but rather a law enforcement one. But to an even great extent it is a general cultural, ethical one. And it is necessary to solve it completely.

The third principle, on which they insist, is the right of the inventor and the enterprise, which was the first to introduce the invention in industry, to receive the maximum percentage of the profit from the sale of a commodity that has been produced on the basis of the invention. But this question is not settled in the process of restructuring the economic mechanism. It is settled mainly along the lines of the strengthening of cost accounting relations between science and production.

5.

Here, however, one must not pass over in silence the fact that the question of what is called a "job-related invention" is actually urgent. And here is why.

An engineer, say, who has the exclusive right to his own invention, made it on the job, in the process of planned work. Inasmuch as he has the exclusive right to his innovation, he has the right to prohibit its use. This is a disruption of work. Or, having been given the right to introduction, he acquires the opportunity to insist categorically on the assimilation of his development in a period, which leads the planned period, under the conditions of a shortage of resources, and so forth. Disorganization.... While if there are two of them, and both invented something functionally identical, but different in design. Who will resolve the potential conflict in case of such a turn of affairs, if there is no force (instance) which has been given legal leadership with respect to the disputing inventors?

In short, there is no opportunity to grant whomever, even if he is the inventor, whatever opportunity to subordinate collective work in the goal-oriented innovative process to any individual claims. Otherwise precisely real anarchy will also set in.

6.

Finally, there is another extraordinary turn of the "juridical thinking" of the advocates of the exclusive right of an inventor to his invention.

The train of their arguments is as follows: if the exclusive right to an invention belongs to the state, there is no subject of the law, no legal entity as such: there is no one to judge.

This, it must be said, is a very one-sided notion of the subject of the law as such. I can also institute legal proceedings—as they say, "use power."

In principle one must not ignore the constitutional leadership of the Soviet state and deny its sovereign and

exclusive right to an invention as a primary right. Without taking into account this underlying legal principle, as applied to legal relations in invention, it is impossible to understand that the rights of all legal entities, who are involved in invention and the innovation process as a whole, are actually secondary. As we were convinced at the start, Lenin's 1919 decree was based precisely on this presumption.

It turns out that the advocates of the exclusively patent protection of the rights of the inventor, who are speaking out extensively in the press and even on television, are proceeding from illusory historical and legally naive notions. That is why they are making a large number of theoretical mistakes and practical blunders. This, of course, does not mean that they do not see at all a number of truly sore points.

However, it is necessary to seek means of treatment by no means in the "modernization" of events of history, but in the sober realization of the realities of the past and the present and in the search for truly promising solutions.

7.

Incidentally, such close attention was devoted here to the analysis of Lenin's 1919 decree not at all in order to perpetuate the statutes of those times. Nearly 70 years have passed since the first Soviet legislative act on invention law.

Today the times of restructuring and the acceleration of socioeconomic and scientific and technical progress in the country have come. The times of its more and more active involvement in international trade and the international division of labor.

Of course, this requires the introduction of such statutes which are capable of affording a growing group of enterprises, associations, and organizations the opportunity to aspire deliberately to the independent use of innovations. For this one should now give the author's certificate broader statutory properties and patents, which are issued to the holders of author's certificates and to enterprises, organizations, and foreign firms, an authorizing role for the use of several inventions. However, the examination of the approaches to such decisions and their consequences goes beyond this article.

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Joint Soviet-Indian Research Program Described

18140322a Moscow PRAVDA in Russian 15 Jun 88 p 4

[Article by V. Korovikov, PRAVDA correspondent, and N. Pritvits, scientific secretary, USSR Academy of Sciences Siberian Department Presidium: "Common Concerns of Siberia and India." Passage in boldface as published]

[Text] Recently, the first session of the joint Soviet-Indian Council for the implementation and coordination of the Comprehensive Long-Term Program for Scientific and Technical Cooperation was held in the capital of India. For 2 days eminent scientists from India and the Soviet Union discussed the specific details of the research plan. The council co-chairmen, G. Marchuk, USSR Academy of Sciences president, and Professor Ch.N.R. Rao, head of the Advisory Council on Science and Technology under the Indian Prime Minister, reported that, in accordance with the program, fundamental and applied research will be carried out in 15 high-priority areas of science and technology. About 70 specific topics were outlined, and the scientific institutions and leaders for these exploratory creative projects were determined.

"This is the greatest and most comprehensive joint scientific research program of all, ever undertaken by both the Soviet Union and India," declared Academician G. Marchuk. "We hope that its fulfillment will yield a great deal both for world science, as well as for the technical and economic development of our two countries."

Soviet-Indian scientific cooperation has already existed for many years. The stage was set for present-day close cooperation by the preceding work experience of Soviet and Indian scientists. For several years already, scientists at a number of USSR Academy of Sciences Siberian Department institutes have been successfully performing joint research with their Indian colleagues. Several of these projects will be discussed in today's article.

We had to take out the van windows, even though some wind did blow through. True, there was an air conditioner in the vehicle, but it had to be turned off since interference from it was hindering the operation of our equipment. There was virtually nowhere to compensate for this—almost all of the small rivers completely dry up in the dry season. As a matter of fact, our expedition through India concerned precisely to this problem—locating water reserves.

A. Semenov, head of the expedition and doctor of technical sciences, talks about it enthusiastically. Of course, he also talks about the magnificent temples and ancient Indian traditions, but even more, he talks about the serious trials which the "Gidroskop" equipment underwent—the offspring of the Institute of Chemical Kinetics and Combustion of the USSR Academy of Sciences Siberian Department, headed by Academician Yu. Molinyy. The equipment, the full name of which is the "hydrogeological YaMP—tomograph," represents a new class of field geophysical instruments and is intended for seeking and prospecting underground waters up to a depth of 100 meters without drilling wells.

This very science-intensive device in appearance operates quite simply: a 1000-meter diameter wire loop is spread out, a current is passed through it, the instrument receives the signal and, after processing it on the microcomputer included with the equipment, a printer outputs a chart of the water saturation of the underground strata, depending on the depth of the bed.

In our country the "Gidroskop" successfully underwent numerous tests, but these were essentially on forest water-bearing strata. In India it was tested in eight regions differing in geological structure, where it was necessary to study hard shales, basalts, granites, and limestones with a very low water content and which, moreover, had been deposited under conditions such that traditional geophysical methods have no effect. Furthermore, the earth's magnetic field in India has a number of features which necessitated some changes in the equipment.

The "Gidroskop" traveled 9,000 kilometers over the roads of India and operated at the limits of its capabilities in some places. The final results of the expedition have not yet been summed up, but today preliminary conclusions can already be made: the equipment can be used effectively in all areas of India.

Not only was the "Gidroskop" subjected to tests, but so were the expedition members, who spent 2 months continually traveling in an unaccustomed climate. Wherever they worked, they were met with invariable interest and the local specialists, authorities and the population surrounded them with attention.

"Water-finding technology" is one of the eight research projects being worked today on in the Comprehensive Long-Term Program for Scientific and Technical Cooperation between the USSR and the Republic of India in the Period Until the Year 2000, signed July 1987. The Soviet coordinators of four of these projects are scientists from the USSR Academy of Sciences Siberian Department. We have already discussed one of these projects. How is work going in the others?

The USSR Academy of Sciences Siberian Department Institute of Catalysis, head organization on the Soviet side in the "Kataliz" project, has much experience with international cooperation and it is no accident that the CEMA Country Coordinating Center for Industrial Catalysts operates under it. Academician K. Zamarayev, the Soviet coordinator of the project, rated the progress of joint work fairly highly. Cooperation with an experimental collective at a national chemical laboratory in the city of Poona, headed by Doctor L. Doraisvami, is particularly fruitful. Priority areas of mutual interest to both countries have been outlined.

One of these is to find ways to convert methane into products of organic synthesis, which would make it possible to replace petroleum raw materials with natural gas in multi-ton chemical production, to synthesize highly-effective catalysts, and to develop a new technological system for obtaining polymers. Thus, Novosibirsk scientists created an effective catalyst for converting methane into ethylene. In Poona, a catalyst was found for the next stage of the chemical process—obtaining ethylene oxide from ethylene. The combined efforts of the chemists promise to significantly raise the productivity of a number of chemical industries. Today, catalysts obtained by Soviet chemists are being sent to their Indian colleagues for lengthy testing under conditions approximating those in industry.

Another joint research project was devoted to electronics materials science, i.e., the study and creation of materials for modern electronics: mono-crystals and the film structures of especially pure substances. In this field, states Academician F. Kuznetsov, the work coordinator on the Soviet side, we have long-standing ties. The electronics industry in India is developing rapidly. However, this sector of science and of the economy depends to a significant extent on imported reagents and materials. Many Indian specialists believe that India should eliminate this dependency and that cooperation with the Soviet Union will help with this. Moreover, it should be noted that in a number of areas in this scientific field, India holds leading positions. Professor Ch.N.R. Rao is one of the leading specialists in hard body chemistry.

"Today the organizational stage has been completed," Academician Kuznetsov continued. "We have clearly outlined a program of work and have established personal communications among the specialists. Research has begun on growing oxide crystals and the study of the minute structures of electronics materials, surface properties, and others. We have already held a regional Soviet-Indian seminar on electronics materials three times, and have held a joint discussion of the state of affairs in the area of superconductors. Today, at the March meeting in Delhi, a decision was made to considerably expand our work in electronics metallography. Soviet scientists and our Indian colleagues are making every effort to fulfill the outlined program."

The cooperation of chemists and electronics workers is already providing real results. Automated equipment for growing high-quality mono-crystals of a mass of up to 2 kilograms, created by the USSR Academy of Sciences Siberian Department Institute of Inorganic Chemistry, was shown at the Soviet "USSR Science and Technology in the Service of Peace and Progress" exhibition in India. It will not return—the Science Institute in Bangalor is acquiring it, and Dr. Varma has already learned the methods for growing crystals during his training period in Novosibirsk.

Mutual interest in the joint creation and use of the most complex physical equipment unifies specialists of the USSR Academy of Sciences Siberian Department Institute of Nuclear Physics and the Khomi Baba Nuclear Research Center in Bombay, as well as the Center for Progressive Technologies in Indor.

The first and, until recently, the only Institute of Nuclear Physics (IYaF) Center for Synchrotron Radiation in our country had been working with Indian researchers already. They recently conducted a series of experiments here on the spectroscopic radiation of different samples, including samples of new superconductors obtained in India. Great hopes are being placed on the first Indian synchrotron radiation source, the "Indus-1," which has already been designed and will be built here jointly. The Institute of Nuclear Physics has much experience in such work, and the Indian side would be able to take up the development of separate systems and experimental equipment and possibly, in the future, also manufacture them for future installations in the USSR.

Meanwhile, Novosibirsk physicists have started installing an industrial electron accelerator at the Indian Atomic Center. It should be put into use in November of this year. Soviet specialists will then discuss the radiation technologies using the IYaF accelerator, which are being developed and have already been applied in industry, including the radiation hardening of cables, the radiation disinfection of grain and others uses, with their Indian colleagues at a joint seminar.

The prospects for the joint production of industrial accelerators might also be discussed—the Indians have already expressed such a thought. As Academician A. Skrinskiy, director of the Institute of Nuclear Physics, declared in Delhi, the Soviets welcome this suggestion.

"The unbounded heart of India extends to Russia. The great Indian magnet tugs upon Russian hearts," wrote N.K. Rerikh almost half a century ago. New times have brought new ways to bring our peoples closer together. One of them is the growing cooperation of scientists, in which the Siberians hold firm positions.

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Division of S&T Work Among CEMA Member Countries

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[Article by Candidate of Economic Sciences L. Presnyakova and Doctor of Economic Sciences V. Sergeyev under the rubric "The Economy of the Countries of the Socialist Community" (Moscow): "Scientific and Technical Progress and the International Socialist Division of Labor"]

[Text] The economic summit conference of the CEMA member countries, and then the held congresses of the Communist and Workers' Parties of the fraternal countries

posed as the most important task the acceleration of scientific and technical progress.

This stems from the fact that the growth rate of the productivity of social labor and the national income and the amount of material wealth, which the socialist countries can use for accomplishing their own socioeconomic tasks, depend on rapid technological change. In our times the successful solution of this problem in many respects governs the strengthening of the international positions of the countries of the socialist community.

As is known, in preceding years the CEMA countries achieved outstanding socioeconomic results by world standards. By the second half of the 1980's their aggregate income had increased (as compared with 1950) by approximately tenfold, industrial output—by sixteenfold, and the output of agriculture—by threefold.[1] Such impressive growth contributed to the fact that the socialist countries produce today one-fourth of their gross national income and one-third of the world industrial output. In a relatively short period of time the European CEMA countries were able to achieve the level of many industrially developed states of the world in the proportion of industry in the national income, while the leading production complex of the sectors—the machine building complex—yields in them from one-fourth to one-third of the total gross output of industry, while in 1950 the analogous indicator for Bulgaria, Poland, and Romania came to 6-13 percent.[2] The developed machine building of the countries of the socialist community is capable of materializing and duplicating the achievements of modern science and technology.

The fraternal socialist countries have to their credit many achievements in the field of science and technology, which have received world recognition, to which their mutual cooperation is in many respects contributing. They have an enormous scientific and technical potential: thus, more than 5 million people, including 1.6 million scientists, are employed here in the sphere of science and scientific service. With respect to this indicator the socialist countries hold one of the first places in the world: they account for about one-third of the world scientific and technical potential and up to two-fifths of the newly created world patent holdings.

This significant contribution to the development of world science became possible owing to the fact that a developed system of bilateral and multilateral scientific and technical cooperation was formed among the CEMA member countries. Annually they jointly develop about 200-300 new or improved models of machines, instruments, and equipment and develop and improve approximately 100-150 technological processes and 100-200 types of materials and preparations. According to available estimates, the economic impact, which has been derived by the CEMA countries during the last 10 years as a result of the use of joint developments, is equal to 5 billion rubles.

The role of socialist economic integration and the international socialist division of labor is also appearing in the gradual elimination of the substantial differences in the levels of economic development of the countries of the socialist community. Whereas at the moment of the founding of CEMA the ratio between the highest and lowest levels of per capita national income in its European countries came to 3.1:1, the production of industrial output—4.9:1, and agricultural output—2:1, at present it is respectively 1.5:1, 1.6:1, and 1.5:1.[3]

The participation of the CEMA countries in the international socialist division of labor created the conditions for the rapid development in them of advanced sectors, which are oriented not only toward the meeting of national needs, but also toward the output of highly efficient export products. Thus, in Bulgaria it is possible to single out as such battery-powered and motorized truck building, in Hungary—the largest works of buses, assemblies and parts for motor vehicles, in the GDR—shipbuilding, chemical and textile machine building, the production of forging and pressing equipment and railroad passenger cars, in Poland—shipbuilding, the production of road and construction machinery, in Romania—the production of oil drilling equipment and equipment for blast furnaces, in the CSSR—chemical machine building, the production of equipment of nuclear power plants, and the output of heavy trucks.

The established specialization of the countries of the socialist community in the production sphere influences the orientation of their scientific and technical potential. Chemical biological research is undergoing preferential development in Hungary, research in the field of optics—in the GDR, the chemicalization of petroleum, natural gas, and salt—in Romania, and casting under counterpressure—in Bulgaria. The specialization of the scientific and technical potential of each country is also connected with the research and development being conducted in it in the area of the processing and better use of raw materials: petroleum—in Romania, the ores of nonferrous metals and low-calorie lignites—in Bulgaria, brown coals—in the GDR, coal and sulfur—in Poland, alumina—in Hungary, and so on. This natural process is creating the conditions for the changeover to a selective scientific and technical policy of development, the necessity of the implementation of which is especially acutely perceptible for the small socialist countries.

International specialization enabled individual countries to reject the further development of unpromising sectors that have a low profitability and to concentrate efforts on the sectors, for the development of which they have natural, manpower, technological, or other advantages. For the economic progress of Bulgaria, for example, electronics and computer technology are acquiring greater and greater importance, Hungary—the science-intensive sectors of electrical engineering, the GDR—the production of control equipment and instrumentation, high-quality optics, and diverse sectors of chemistry, and

Czechoslovakia—atomic machine building, the production of other types of technologically complex equipment, and the production of means of transportation.

The achievements of the countries of the socialist community are indisputable. At the same time the potentials, which are incorporated in the international socialist division of labor, have not yet received complete realization in such a key direction as scientific and technical progress. Scientific and technical progress and the international socialist division of labor are closely interconnected, which is manifested in two ways. On the one hand, the international socialist division of labor is speeding up the development of scientific and technical progress in the socialist countries, while, on the other, scientific and technical progress, while leading the development of the international socialist division of labor, is giving rise to new phenomena and processes and the corresponding problems and tasks, requiring the receptivity and elasticity of the international socialist division of labor with respect to the new requirements. The resolution of the arising contradictions between the new stage of development of scientific and technical progress and the established model of the international division of labor is the motive force of the intensification of the international socialist division of labor and the acceleration of scientific and technical progress in the socialist countries. This conclusion is confirmed by the analysis of the development of scientific and technical progress and the international socialist division of labor. Thus, during the postwar period scientific and technical progress developed mainly in an evolutionary manner, that is, by the improvement of operating technologies and the partial modernization of machines and equipment. The relative security in manpower, fuel, and raw material resources and the average technological level of the output being produced contributed to the evolutionary development of scientific and technical progress.

The exhaustion of some extensive factors of production was offset by the active use of others. For example, when by the late 1960's in the European socialist countries the basic reserves of the commitment of additional manpower resources to production had decreased substantially, additional resources of power and raw materials, as well as the more extensive use of traditional mechanical technology began to play an important role in increasing the efficiency of social production in them. Thus, in the middle of the 1980's (as compared with 1960) the consumption of energy resources in the CEMA countries had increased by 4.2-fold (including in Bulgaria—by tenfold, in Hungary—by 4.5-fold, in the GDR—by 2.8-fold, in Poland—by 4.4-fold, in Romania—by 8.5-fold, and in the CSSR—by 3.3-fold).[4]

As is known, the Soviet Union is the main supplier of fuel, energy, and raw material resources to the countries of the socialist community. In the late 1960's and early 1970's, the production of petroleum, and then gas and, accordingly, their deliveries to the European CEMA member countries increased sharply in the USSR. Soviet deliveries of petroleum, petroleum products, natural gas, hard coal, and electric power enabled them to improve the structure of the power balance and created the conditions for the development in them of such advanced sectors of industry as the petroleum refining and petrochemical industry, mineral fertilizer production, and others. During the first half of the 1980's 80 percent of the import needs of the CEMA countries for petroleum and petroleum products, nearly 100 percent of the needs for natural gas, and more than 60 percent of the needs for hard coal were met by deliveries from the Soviet Union.[5].

During this period the reciprocal deliveries of traditional types of machines and equipment increase. The extensive use of traditional mechanical technology and the additional commitment of fuel and raw material resources influenced the ratio of living and embodied labor in the gross social product and the introduction of the achievements of technical progress. Labor-consuming processes were replaced by power-consuming ones, preference was given to technical progress that increases the productivity, for the most part, of living labor. In the structure of industry of the fraternal countries the sectors, which are distinguished by a high materials-output and power-output ratio, underwent development. As a result the partial improvements of traditional technologies led to the formation of a resource-wasting model of the economic development of the national economic complexes of the socialist countries.

In the international socialist division of labor the same pattern as in the domestic development of the socialist countries appeared, which, in turn, brought into being an adequate model of the international socialist division of labor.

The period of 1971-1980 was critical in the development of the economy of the CEMA countries. The expansion of the export of fuel and raw material resources came up against objective limiters (the nonrenewable nature and limitedness of the reserves of minerals, the increase of the capital intensiveness of their extraction and the spending on transportation from remote regions, and so on). This applies to all the countries of the community, but first of all to the basic fuel supplier, the Soviet Union, where the centers of its production have shifted to remote, hard to reach regions.

The narrowing of the sources of extensive growth and the accumulation of resource limitations led to the appearance of a number of adverse trends in the reproduction process of the CEMA member countries. Negative processes are observed during this period in the international socialist division of labor as well. Outwardly this found expression in the fact that at the turn between the 1970's and 1980's the volume of reciprocal foreign trade between the socialist countries decreases slightly. For example, whereas during 1971-1975 the average annual increases of the foreign trade turnover of the CEMA

countries (in fixed prices) came to 9.4 percent, during 1976-1980 they came to 5.3 percent, while during 1981-1985 they came to 3.1-3.2 percent. During these years the ratio of the growth rates of the foreign trade turnover and the produced national income decreased here from 1.2 to 1 during 1981-1983. In 1985 this coefficient already did not exceed 0.9.[6]

The share of capitalist states in the meeting of the import needs of the CEMA countries with respect to a number of types of machines and equipment also increased accordingly. In the early 1980's the share of capitalist states in the import by the socialist countries of metal working equipment came to 49 percent, mining, metallurgical, and petroleum equipment—52 percent, and equipment for the chemical industry—65 percent of the total volume of reciprocal trade. The share of agricultural products and food in the reciprocal commodity turnover of the CEMA countries was 10 percent, while with the EEC it was 13 percent, while that of industrial consumer goods was respectively 9 and 25 percent.[7]

The indicated trend testifies to the weakening of the mutual economic relations of the CEMA member countries in the modernization of their production apparatuses and in the accomplishment of their most important socioeconomic tasks. Here, in particular, the insufficiently high quality of goods and the insufficiently high reliability and durability of items, which are produced within the national economies, played their role, which to a significant degree checked the process of the development of the international socialist division of labor and decreased appreciably the effectiveness of the economic integration of the CEMA countries.

However, in our opinion, the contradiction, which arose among the new stage of development of scientific and technical progress, the extensive model of the international socialist division of labor, and the corresponding forms and methods of cooperation of the fraternal countries, which formed during the period of the evolutionary development of scientific and technical progress, was the basic, intrinsic cause of the formed situation. The development of the intersectorial division of labor is confirmation of this. For a long time it was successfully used in the economic cooperation of the socialist countries. However, having at its basis the increase of fuel and raw material deliveries in exchange for products of the processing industry (which, in point of fact, is a manifestation of extensive development in the international sphere), by the 1980's the intersectorial division of labor had actually reached its limit.[8]

It is possible to understand the new trends in the development of the international socialist division of labor only by having identified the peculiarities of the present scientific and technical revolution. In its historical significance it is comparable to the industrial revolution of the 19th century, although the scale and quality of production since that time have changed beyond recognition. In the past 2 decades science and technology have discovered many new, highly effective means of further adapting nature to the needs of man, which make it possible to resolve the objectively formed contradiction between the increasing needs of production for power and raw materials and the even more rapidly increasing cost of material resources in connection with the transition to worse conditions of production and transportation, with the increase of spending on nature conservation, and so forth. In turn, the narrowing of the sources of economic growth is an important stimulus for the changeover to the mass dissemination of fundamentally new technologies and the rapid replacement of not only worn out, but also obsolete production equipment. The appearance of fundamentally new equipment and technologies and their mass dissemination are characteristics of the qualitatively new, revolutionary stage of development of scientific and technical progress.

Qualitatively new motive forces are characteristic of the present scientific and technical revolution. Whereas in the industrial revolution machine building and the mining industry served as the bearers of development and progress, electronics, which embodied its ideas in computer technology and automation equipment, atomic power engineering, which has become the most important sector of power engineering, and physical chemical biology and genetics, which established biotechnology, are, first of all, the motive forces of the present scientific and technical revolution.

The present scientific and technical revolution is, first of all, a technological revolution. The qualitative change of production technologies is making it possible to accomplish the most important task of the economic strategy of the CEMA member countries—the assurance of economic growth with the relative or absolute decrease of the expenditures of manpower, objects of labor, fuel, raw materials, materials, and fixed production capital. Here it is necessary to note that the possibilities of increasing production efficiency without a radical change of technologies are exhausted quite rapidly.[9]

Today the countries of the socialist community already have a large number of base technologies which constitute the character of the present scientific and technical revolution. Among them are laser and plasma technologies, technologies, which involve the use of superconductivity of high pressures, powder metallurgy, high-temperature self-propagating synthesis, and others. These and other base technologies govern the modernization of the production apparatus.

On the basis of the requirements of the present scientific and technical revolution, the fraternal countries have to achieve the restructuring of the production apparatus in the following basic directions.

The first of them is the technical and technological respecialization of the production apparatus on the basis of the achievements of the scientific and technical revolution. It will require the comprehensive introduction in

production of advanced technologies and the latest equipment. First of all, technical and technological reequipment will encompass the key sectors of the economy. In all the countries these are the sectors of machine building, the food industry, and the fuel and power and raw material complexes.

The technical and technological modernization of production dictates its structural reform. Here its nature will be determined by the nature of scientific and technical progress and by the directions of the modernization of the material and technical base of production; by the available scientific and technical potential and production potential of each country; by the results of the mutual adaptation of structural changes in the economy of the CEMA member countries. It is possible to assume that during the 1980's and 1990's these changes will have the nature of a differentiated and contradictory process, in case of the implementation of which a condition for the development of some sectors will be the respecialization or curtailment of others.

The technical and technological restructuring of the production apparatus of the fraternal countries and the structural changes in their economy are creating the prerequisites for the development of a new technological model of the international socialist division of labor in conformity with the requirements of scientific and technical progress.

The increase of the role of associations, enterprises, and combines is the second, no less important direction of the restructuring of the production apparatus of the socialist countries. This is due to the distinctive traits of the scientific and technical revolution—flexibility and mobility. These qualities are turning into the most important factor, which determines the competitive ability and efficiency of socialist production and the prospects of its development. The increase of the role of the basic production unit predetermined the development of the integration process on the microlevel—among economic organizations—with the use of new forms of their interrelations.

As a result, under the influence of the requirements of the present scientific and technical revolution, internal factors were responsible for two clear trends in the development of the international socialist division of labor: the change of the structure of the division of labor among the CEMA countries; the independent appearance of the producers of export products on the foreign market,[10] the establishment (in various forms) of international economic organizations, and the development of direct scientific production relations among them.

In order to achieve the structural reform of the international socialist division of labor and rapid development in the priority directions of scientific and technical progress, the countries of the socialist community, by generalizing their own and world experience, as well as the results of their own scientific and technical forecasting, came to an agreement on concerted actions on the development and use of fundamentally new types of equipment and technologies by the concentration of efforts and the organization of close joint cooperation within CEMA in five priority directions: electronization, integrated automation, atomic power engineering, new materials and the technologies of their production and processing, and biotechnology.

For the organization of joint actions of the socialist countries on the development of the priority directions of the present scientific and technical revolution the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 (KP NTP) was adopted at the 41st (Extraordinary) Session of CEMA (Moscow, 1986). Its implementation will make it possible to accomplish a revolutionary task—to achieve the highest level of science, technology, and production in the most important directions of scientific and technical progress. This, in turn, will contribute to the increase (by at least twofold) by 2000 of the productivity of national labor in the CEMA member countries and the sharp reduction of the specific consumption of energy and raw materials for the production of a unit of their national income.[11]

The conceptual basis for the further development of the international socialist division of labor with allowance made for the requirements of the present scientific and technical revolution was laid in the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000. An understanding on the development of a collective concept of the international socialist division of labor for the period of 1991-2005 was reached at the 43d (Extraordinary) Session of CEMA. This document should aid the fraternal countries in the formation of the basis for the pursuit of a more thorough, coordinated economic policy and in the improvement on this basis of the type of specialization and the structure of their national economy and the reciprocal commodity turnover of each of them with allowance made for the requirements of scientific and technical progress, as well as specify a clear guideline with respect to the possibilities and reserves, which are contained in mutual cooperation.

In this connection the importance of unity in the pursuit of a concerted scientific and technical, structural, and investment policy is increasing.

The global nature of the problems of the present scientific and technical revolution, the effective solution of which presumes the uniting of efforts on an international scale, the latest technology, which involves large one-time expenditures that do not immediately provide a return, as well as the reform of the structure of the economy had the result that today no country in practice is capable of supporting independently the conducting of research over the entire broad front of science and technology at the level of the present requirements. It is

not by chance that the present scientific and technical revolution is contributing to greater and greater internationalization, while it is becoming itself a result of the international cooperation and division of labor. At the present stage the task of the coordinated scientific and technical revolution is to determine within the collectively specified five priority directions of scientific and technical progress, which were selected at the first stage of the coordination of scientific and technical policy as the common ones for all the CEMA member countries, for each of them their own selective strategies in the area of the rapid assimilation of scientific and technical achievements. On the basis of the specialization and cooperation of their scientific and technical potentials the countries of the socialist community will be able to ensure their own rapid development in the priority directions of the scientific and technical revolution and to prepare the necessary scientific and technical reserve for the structural reform and technological modernization of production.

Another important trait of the scientific and technical revolution is the fact that at the initial stage it already requires the accumulation of significant assets, which considerably exceed the real possibilities of the individual countries, which increases the role of the international socialist division of labor in the process of the structural reform of the economy of the fraternal countries. The essence of the changes in the structural policy of the countries of the socialist community consists in fundamentally linking the structural reconstruction of production with its technological modernization, which requires the interaction and cooperation of the national scientific, technical, and production potentials of the socialist countries, as well as in overcoming the existing isolation between the two most important directions of integration (scientific and technical cooperation and production cooperation), having made the transition from uncoordinated forms of cooperation, which are not interconnected, to coordinated scientific and technical cooperation and production cooperation.

The essence of the changes in international investment policy consists in the increase of the role of the coordination of capital investments. Here the coordination of national capital investments and the consideration of the movement of capital within the integration community and the jointly used assets of joint institutions (for example, the International Investment Bank) are the basic task.

As a result, whereas the coordinated scientific and technical policy contributes to the emergence of the scientific basis, the coordinated investment and coordinated structural policy forms the material basis for the transition to a new model of the international socialist division of labor and for the acceleration of scientific and technical progress in the CEMA countries.

The restructuring of the model of the international socialist division of labor includes the change of not only the content, but also the forms of its organization. The old forms of cooperation, which took shape during the period of extensive economic development, are not capable of ensuring the dynamic growth of the cooperation of the socialist countries. Therefore, they are faced with the task to find new means, to change over to the direct (immediate) interaction of enterprises and sectors, and to establish joint associations, design bureaus, and laboratories. As M.S. Gorbachev noted in his book "Perestroyka i novoye myshleniye dlya nashey strany i dlya vsego mira" [Restructuring and New Thinking for Our Country and for the Entire World], "to cling to the old forms of cooperation and to confine oneself to them would mean to do direct harm to both the prestige and the possibilities of socialism."[12]

International scientific production cooperation should be grouped with the most important, advanced forms of the integration interaction of the fraternal countries. This is one of the manifestations of the international specialization and cooperation of production, which is the interconnected activity of the enterprises and organizations of the CEMA member countries, which are participating in the international division of labor in the area of scientific research and experimental design work, production, and marketing. The scientific development and output of modern products, the scientific development and industrial assimilation of new technologies, and so on are its goal.

Practical experience has shown that the present scientific and technical revolution is also making changes in the forms of cooperation of the socialist countries: cooperation separately at the stages of production and scientific research cannot be stable; cooperation, which encompasses both these stages, can be relatively long. Thus, it is possible to define scientific production cooperation as the constant process of the interaction of science and production, which takes the form, on the one hand, of the adjustment of production on the basis of the leading development of science and, on the other, of its orientation toward the needs of production.

The national economic level of the scientific production cooperation of the CEMA member countries is its highest form. Precisely here the demands, stimuli, and goals of socioeconomic development are shaped and the main interest of each state is formed. The specialization of the national economic complexes of the countries of the socialist community as a specific type of the international socialist division of labor is the basis for this form of cooperation.

The development of the new technological model of the international socialist division of labor is posing for scientific production cooperation at the national economic level the following strategic tasks:

1. The pursuit of a coordinated economic policy of the socialist countries, which includes a coordinated scientific and technical policy, a coordinated international

structural policy, and a coordinated investment policy as the material basis for the thorough restructuring of the prevailing model of the international socialist division of labor.

2. The assurance of the collective technical and economic invulnerability of the countries of the socialist community, which presumes the pursuit of a coordinated economic and scientific and technical policy with respect to third countries.

The interaction between the national economic complexes of the CEMA member countries presumes the implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 and the measures of tens of bilateral long-term programs of the development of cooperation in science, technology, and production to 2000 and of hundreds of intergovernmental and interdepartmental agreements and sectorial programs.

On the basis of such intersectorial interaction of the economies of the fraternal countries, which has been coordinated for a long time, the key directions in the development of their sectorial cooperation of a scientific production nature are determined. The intrasectorial division of labor and its cooperation are infinite in their essence, while intersectorial exchange has its economic and physical limits. Therefore, international intrasectorial cooperation acts as a factor of the making of the foreign economic relations of the CEMA countries dynamic and their intensification and requires the combination of a high degree of reliability of their foreign relations with flexibility.

An important role in the development of this factor belongs to direct (immediate) ties, which are one of the forms of the international intrasectorial cooperation of production between enterprises and organizations of the socialist countries. They are implemented for the establishment of stable and mutually advantageous cooperative production. As a form of the organization of the international socialist division of labor direct times are based on independent decision making by the enterprises and organizations that are partners. In other words, direct times are a form of the manifestation of the economic freedom of the enterprise. In this direct times as an economic relation contain market elements. However, the boundaries of the independence (freedom) of an enterprise are specified by the socialist state on the basis of the necessity of ensuring the systematic functioning of the entire national economic complex. This testifies that direct times as an economic relation of socialism inevitably have at the same time a planned basis.

As a result in most general form it is possible, in our opinion, to define direct times as a means of carrying out the sharing of production activity and its results at the level of economic units. The independent making by economic organizations of economic decisions on questions of foreign economic cooperation—within the established competence, their economic interest in the timely, high-quality, and effective settlement of questions of production cooperation, and their responsibility for it—is a characteristic feature of it.

The idea of direct times was advanced in 1971 in the Comprehensive Program of Socialist Economic Integration. However, at that time the necessary conditions for their development had not yet ripened. A new stage in the development of direct ties began in the early 1980's.[13] Today the broadening of the range of application of the forms of direct (immediate) cooperation is characteristic of it. Direct ties are encompassing newer and newer areas of economic activity and are being developed in the direction of the gradual transition from uncompensated to commercial, economic forms of cooperation.

At present more than 4,000 enterprises and organizations of the CEMA member countries have established direct interaction with each other. Among them are more than 1,300 production collectives from the Soviet Union.

The effectiveness of direct ties is manifested most completely in case of joint production operations. It is governed by such factors as the saving of time by the speeding up of the processes of introducing new achievements on the basis of mutual assistance and experience, the optimization of the use of the aggregate scientific and technical potential and production potential of the partner enterprises, and the rationalization of the expenditures of material and intellectual resources.

The development of direct production economic ties leads right up to management on the basis of joint ownership (joint use, possession) by the establishment by the partners from two or more countries of a joint enterprise, a joint firm, an international scientific production association, an international economic organization, a joint design bureau for the development of individual types of products, their production, the rendering of engineering services, or the fulfillment of other tasks. The efforts, which are aimed at the development of immediate contacts, the establishment of scientific production associations, joint enterprises, and so on, are not an end in themselves. These are a requirement of the present stage of the scientific and technical revolution.

For example, the experience of two Soviet-Bulgarian scientific production associations in machine tool building: the Ivanovo-ZMM and the Krasnyy proletariy-Beroye associations, showed that the joint use of potentials makes it possible not only to increase more rapidly the production of equipment, but also to develop in a shorter time the latest types of it. Thus, during the past year the production of machining centers at the Soviet-Bulgarian Ivanovo-ZMM Association was increased by 62 percent (with a plan of 45 percent), while the production of flexible production modules at the Krasnyy

proletariy-Beroye Association was increased by 61 percent (with a plan of 57 percent). These associations not only developed a number of new, advanced types of machine tool equipment, but also (which is especially important) simultaneously shortened by 20-30 percent the time of its production (as compared with analogous items).

An agreement on a joint Soviet-Bulgarian enterprise of motor vehicle electronic systems, as well as on the joint Rechmortrans Transportation Enterprise has been signed. The first Hungarian-Soviet joint enterprise, the Micromed Enterprise, has been established.

The goal of the joint Bulgarian-Soviet Agroavtomatika Scientific Production Association with the center in Tolbukhin is to increase the efficiency of the production of means of the electronization and automation of tractors and agricultural machinery. A joint Czechoslovak-Soviet laboratory, which will engage in the development of methods of intensifying the output of production of animal husbandry on the basis of the use of new biotechnologies, has been opened in Nitra (the CSSR).

The Interrobot International Scientific Production Association (Bulgaria, Hungary, the Republic of Cuba, Poland, the USSR, and the CSSR) is organizing its activity. The previously formed Soviet-Czechoslovak Robot Association has also been included in it. The activity of a number of sectorial international organizations, which were established in previous years, is being stepped up and improved.

The joint enterprises, which operate in traditional (fuel and raw material) sectors of industry, are showing rather good results. They, in particular, are playing an important role in the development of the economy of the less developed CEMA member countries. Thus, the Soviet-Vietnamese enterprise for the refining and production of petroleum and gas on the continental shelf of the southern part of the SRV in June 1986 obtained the first petroleum. The Soviet-Mongolian Mongolsovtsvetmet Association and the Erdenet Association are expanding their activity.

Of course, the implementation of the new model of the international socialist division of labor in practice will raise new problems, which cannot be solved immediately, without gained experience and bold transformations. But it is now already quite evident that the transformations in the international socialist division of labor have assumed an irreversible nature and are due to the objective needs of the development of scientific and technical progress.

Footnotes

1. Calculated according to "Statisticheskiy yezhegodnik stran-chlenov Soveta Ekonomicheskoy Vzaimopomoshchi. 1985" [Statistical Yearbook of the Member Countries of the Council for Mutual Economic Assistance. 1985], Moscow, "Finansy i statistika", 1985, pp 53, 73, 181.

2. Calculated according to "Statisticheskiy yezhegodnik stran-chlenov Soveta Ekonomicheskoy Vzaimopomoshchi. 1985," p 86; "Narodnoye khozyaystvo SSSR za 70 let. Yubileynyy statisticheskiy yezhegodnik" [The USSR National Economy Over 70 Years. An Anniversary Statistical Yearbook], Moscow, "Finansy i statistika", 1987, pp 161, 163, 165.

3. See E.Ya. Sheynin, "Socialist Economic Integration: Reality and Fabrications," VNESHNYAYA TORGOVLYA, No 7, 1986, p 41.

4. Calculated according to "Statisticheskiy yezhegodnik stran-chlenov Soveta Ekonomicheskoy Vzaimopomoshchi. 1985," p 63.

5. See E.Ya. Sheynin, op. cit., p 39.

6. See Yu.S. Shiryayev, N.V. Bautina, "CEMA: Problems of the Improvement of the Economic Mechanism of Mutual Cooperation," PLANOVOYE KHOZYAYSTVO, No 2, 1987, p 109.

7. See O.T. Bogomolov, "CEMA: Economic Strategy of the 1980's," KOMMUNIST, No 7, 1983, p 76.

8. It is a question of not the absolute, but the relative exhaustion of reserves. During the period of the technological and structural reform of the economies of the CEMA member countries the intersectorial exchange, for example, of products of agriculture and the extractive industry for items of the processing industry continues to be of great importance. However, it can no longer play a decisive role, inasmuch as it checks the development of both the supplying country and the consuming country. The present stage of the development of scientific and technical progress urgently requires the transition to a higher level of the international socialist division of labor—to a technologically specialized model. In turn, the technologically specialized model of the international division of labor influences the structure of reciprocal barter. As V.M. Kamentsev notes, in world trade the increase of the share of the products of the processing industry is a stable trend. It has now reached about 70 percent of the world commodity turnover, moreover, products of machine building make up approximately 30 percent, while by 2000, according to estimates, will exceed 35 percent. "Nonmaterial" goods—patents, licenses, know-how, services like engineering—hold a more and more noticeable place. The structure of Soviet exports does not conform not only to the general laws of the development of demand on the world market, but also to the structure of physical production in our country. In recent years machines and equipment have taken up in Soviet exports not more than 15 percent, while raw material goods have accounted for more than 60 percent, including energy carriers which have accounted for nearly half of all commodity exports. In domestic production the opposite picture is observed: the sectors of the machine building complex account for 28 percent of the output being produced, while the fuel

and power sectors accounting for 11 percent (see V.M. Kamentsev, "Problems of Foreign Economic Activity," KOMMUNIST, No 15, 1987, pp 25-26).

9. All this explains the great attention, which scientists of the countries of the socialist community are devoting to the substantiation of the necessity of replacing production technologies. In the opinion of German scientist K. Hartmann (the GDR), at present there is not one material- or energy-saving problem which would not be connected directly or indirectly with technology. What at first glance is perceived as a shortage of raw materials, fuel, and power, in fact is a shortage of technologies. Technological progress is becoming more and more the basis of the increase of the efficiency of the economy. Thus, for example, the annual standards of the reduction of the specific consumption of raw materials and materials (from 5 to 10 percent), which are envisaged by the GDR national economic plan, could not be achieved by traditional methods. The possibility to solve the problems that had arisen appeared only on the basis of the use of technologies of a new type, which are aimed at using primary raw materials completely (in this case waste-free production technologies are meant), at economizing entire production stages, and at achieving the miniaturization of designs. Here the new technologies are ensuring a saving of labor, raw materials and materials, and capital investments per unit of output (see K. Hartmann, "Wachstumsfaktor Technologie," EINHEIT, No 3, 1985, pp 503-510).

The question of the influence of production technologies on product quality holds a special place in the research of scientists of the socialist countries. One should admit, Bulgarian scientists note, that some underestimation of technologies in the solution of the problem of the quality of items has been committed. The problem of quality has been linked only with finished items and to a smaller extent with the technologies of their production. At present, when formulating the strategy of the acceleration of scientific and technical progress and the increase of the quality of the output being produced, one should analyze thoroughly the technologies being used and, along with programs of the updating of products, update technologies on a large scale. It is necessary, on the one hand, to introduce extensively leading technologies with a high decree of mechanization and automation and so on and, on the other, to enrich substantially the range of technologies being used (see "A Round-Table Discussion at the Main Administration for Standardization and the Publication STANDARTI I KACHESTVO," STANDARTI I KACHESTVO, Vol 10, No 4, 1985, pp 3-27).

10. At present 22 USSR ministries and departments, as well as 77 associations, enterprises, and organizations have obtained the right to carried out directly export-import operations on the foreign market. About 20 percent of the total foreign trade commodity turnover of the USSR should be provided by them. Now more than 65 percent of the machines and equipment are delivered to the foreign market directly by their producers. With the gaining of experience and the creation of the corresponding prerequisites the group of such ministries, associations, enterprises, and organizations will expand. An analogous trend in also being observed in other socialist countries.

11. See "Kompleksnaya programma nauchno-tekhnicheskogo progressa stran-chlenov SEV do 2000 goda (Osnovnyye polozheniya)" [The Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 (The Basic Provisions)], Moscow, "Ekonomika", 1986, p 3.

12. M.S. Gorbachev, "Perestroyka i novoye myshleniye dlya nashey strany i dlya vsego mira" [Restructuring and New Thinking for Our Country and for the Entire World], Moscow, Politizdat, 1987, p 169.

13. The actual role of direct ties in the overall system of foreign economic relations of the CEMA member countries is governed by the status of enterprises in their national economic system. Direct ties depend directly on the degree of independence of enterprises within the country, that is, on the level of development of their relations with domestic partners. It is possible to give enterprises as broad rights as you wish in the development of international cooperation, and they will not be realized, if in the domestic sphere they do not have similar rights, or they are not backed by economic measures. The enterprises, which actively undertook the implementation of the corresponding decisions, were also faced precisely with this. Thus, the right granted to enterprises to determine themselves the range and volume of cooperative output under the conditions of the central allocation and limiting of resources and the output being produced for the present remains only on paper. In a number of socialist countries at present steps are being taken on the broadening of the powers of economic and scientific and technical organizations and on the creation of the conditions for their direct (immediate) interaction. In the USSR, for example, such conditions are envisaged by the decrees of the CPSU Central Committee and the USSR Council of Ministers "On Steps on the Improvement of the Management of Foreign Economic Relations" and "On Steps on the Improvement of the Management of Economic, Scientific, and Technical Cooperation With Socialist Countries" (1986). To execute them a procedure of the implementation by associations, enterprises, and organizations of the country of direct production and scientific and technical ties with enterprises and organizations of other CEMA member countries has been adopted in the country. In the CSSR similar conditions are regulated by "The General Rules of the Establishment of Direct Ties of Socialist Organizations of the CSSR With Organizations of the CEMA Member Countries" (which was approved by a decree of the government), and so on.

Computer 'Fair' at Ulan-Ude Has Numerous Problems

18140004b Moscow NTR: PROBLEMY I RESHENIYA in Russian No 14, 19 Jul-1 Aug 88 pp 2-3

[Article by V. Pokrovskiy: "A Computer Festival"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] In Ulan-Ude the celebration with perhaps a slightly cumbersome title: the First International Computer Festival "Information Science: Ecology, Peace, Progress," lasted 8 days (from 27 June to 3 July).

This was truly a celebration: for the first time the Buryat capital was the sight of the holding of an exhibition and trade fair with the participation of both domestic and foreign "merchants"; children filled the city Palace of Pioneers, where the most diverse computer games were placed at their disposal.

Seminars and round tables, which were devoted to the legal questions of information science and to numerous topical problems, in the solution of which it could help: problems of education, medicine, ecology, management, and production, were held daily; the most interesting new items of film distribution, which were specially delivered from Moscow, such as "The Sacrifice" of Tarkovskiy, "Ragtime" of Forman, "The Adventures of a Dentist" of Klimov, and so forth, were shown in the movie theaters of the city. They spoke about the festival in lines, on streetcars, and on the streets, while in front of the exhibition hall, where the main exhibit was located, from morning to evening hundreds of citizens, who were willing to exchange their ruble for the right to examine the exhibition, patiently got soaked in the rain.

True, the festival gave rise not only to raptures, but also to the expression of dissatisfaction. Many participants complained of the "nonmarket" appearance of the exhibition, the poor work of services, and the impossibility of properly advertising their commodity to the consumer. Two different things—an exhibition for specialists and an exhibition for the population—actually proved to be combined. The large influx of laymen did not enable firms and cooperatives to demonstrate the brought "software" fully. Instead of computer programs, such as the designer workstation, accountant workstation, editor workstation, and so on, it was necessary to duplicate mainly the work of the Palace of Pioneers and to demonstrate computer games, and the "defect report" is not confined to this.

"But what do you want," M. Vandanimayev, one of the organizers of the exhibition, said to me. "All this was done in mad haste by a small number of people, who have an insufficient amount of assets and a practically complete lack of experience in the implementation of such measures. This festival was organized, it can be said, as a public service.

"At first we had very modest intentions," he continued. "The point is that many enterprises of the city need computer hardware, while the usual means of acquiring it is lengthy, complicated, and unreliable. So we decided to organize here an exhibition—let not the buyer seek a commodity, but the commodity, a buyer. But the All-Union Komsomol Central Committee, to which we turned for assistance, could organize this exhibition only in 1.5 years. Such a pace did not suit us at all.

"Having united with the Moscow Sotrudnichestvo Center of the Creative Scientific and Technical Work of Youth, we, that is, the Baykal Center of the Creative Scientific and Technical Work of Youth, decided to undertake this matter ourselves. Then we thought: But why be so modest? Let there be not simply an exhibition, but a citywide computer celebration. There were many ideas. The city part committee and the Buryat Council of Ministers supported us—without their help the festival would hardly have taken place at all. At any rate, we managed to turn the 1.5 years of preparation into 1.5 months.

"Of course, due to the rush and due to our inexperience we did not envisage many things, we were not able and simply did not have time to do much of what had been contemplated. It is very disappointing that the socialist countries were not represented at the exhibition, while we had counted mainly precisely on them. After all, domestic hardware for the present is still unreliable, while Western hardware threatens with the need to pay currency for it and with the difficulties with repair."

In short, a little better luck next time. The situation is obviously among those, about which it is customary to say with an intelligent look: "On the one hand ...on the other hand...." Indeed, if you take the position of the organizers, participants, or specialists, who need advanced hardware and many of whom believe that the level of the hardware and programs, which were exhibited here, and the exhibition as a whole leaves much to be desired, one will have to admit that the festival was not too much of a success. "Recognized" firms will hardly go willingly to the next fiesta of this sort. On the other hand, there is the most lively interest in the festival of the overwhelming majority of city dwellers. For example, one of the visitors of the exhibition, as soon as the conversation turned to its shortcomings, literally flew up:

"You capital journalists! Look around! How many people there are there! Many of them have seen a computer only on television, while now they are all here. They are becoming acquainted for the first time with the possibilities of modern computer technology, you cannot imagine what this is for us. The attraction of the interest of the residents of Buryatia to information science and, through it, to the scientific and technical revolution, to the new life, if you wish, was the main task of the festival. And this task has been fulfilled."

And it seemed that he was right. In the end, specialists will find what they need, since they have already begun to search. The organizers, having taken their lumps at

the festival, with much skill will begin the preparation of the next one. But this one, the first, will probably be remembered by everyone with precisely a sense of common excitement.

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Conference on New MNTK Model Statutes

18140004a Moscow NTR: PROBLEMY I RESHENIYA in Russian No 14, 19 Jul-1 Aug 88 p 1

[Article by Candidate of Economic Sciences I. Ukrainskaya, the Academy of the National Economy attached to the USSR Council of Ministers: "A Stimulus Instead of an Order"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] The new draft of the model statute on interbranch scientific technical complexes was submitted to managers and specialists of interbranch scientific technical complexes at a conference, which was held on 6 July of this year at the Academy of the National Economy attached to the USSR Council of Ministers.

Responsible officials of the USSR State Committee for Science and Technology—this draft is now being finished up precisely there—especially emphasized that the organizational pressure within complexes will weaken, that the head organizations will not get in their hands an "administrative club" for the coercion of partners. Now it is necessary to count only on economic steps of influence and on the mutual interest and responsibility of the partners in scientific and technical development.

The representatives of the complexes discussed in detail the system of the formation of the funds of interbranch scientific technical complexes, the procedure of distributing the profit, and the possible benefits. As should have also been expected, the specialists of interbranch scientific technical complexes, who are dealing with the introduction of cost accounting, scrupulously count every ruble and every earned kopeck, which is derived by the complex, and recalculate all the percentages of deductions and the amounts of the benefits being granted.

Taking into account the importance of the draft of the model statute, which was being considered, and the interest of the conference participants, it was decided to examine its content more closely directly at interbranch scientific technical complexes.

Chief of the Consolidated Department of Scientific and Technical Progress of the USSR State Planning Committee V.V. Simakov, who addressed the conference, appealed to those present to look a little farther than the horizon of cost accounting, percentages, and earned kopecks. Having recalled the basic function of interbranch scientific technical complexes—to bear responsibility for the development of the priority directions of science and technology—he stressed that for the present only five or six of the functioning complexes—first of all the Nauchnyye pribory, Rotor, and Mikrokhirurgiya glaza complexes—are worthily coping with the set tasks. They are indeed ensuring a real breakthrough in the corresponding directions of science and technology.

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Candidates for Lenin Komsomol Prize for 1988 Listed

18140325 Moscow KOMSOMOLSKAYAPRAVDA in Russian 12 Jul 88 p 4

[List of works submitted to the Komsomol Central Committee Commission for the second round of competition for the 1988 Lenin Komsomol Prize in the area of science and technology: "From the Komsomol Central Committee Commission on Lenin Komsomol Prizes in the Area of Science and Technology"]

[Text] The Komsomol Central Committee Commission on Lenin Komsomol Prizes in the area of science and technology has examined 110 works done by young scientific workers, VUZ teachers, engineers, graduate students, and workers, presented for the competition for the 1988 Lenin Komsomol prizes. On recommendations by expert groups, the Commission has allowed 47 works to enter the second round of competition for the Lenin Komsomol prizes in the area of science and technology.

In publishing this list of works, the Commission requests that the leaders of scientific and scientific-technical societies, scientific institutions, enterprises and higher educational institutions, as well as the leaders of party, Komsomol and other social organizations, send their opinions and observations, as well as materials for social discussion, to the Commission before 15 September 1988, to the address: 103982, Moscow, Downtown, B. Khmelnitskiy St., Building 3/13, Komsomol Central Committee Commission on Lenin Komsomol Prizes in the Area of Science and Technology. Telephone: 206-85-84, 206-89-08.

S.M. Avanesyan, I.M. Baranova, S.V. Govorkov, V.B. Leonov, Ye.D. Mishina, A.A. Nikulin, G.A. Paytyan, A.V. Petukhov, S.A. Ratseyev and V.I. Tsytsanu—"New Methods for Non-Linear Optical Diagnostics of a Surface, Lines of Separation and Surface Structures of Semiconductors and Metals." Recommended by the Komsomol Committee and the Council of Young Scientists at Moscow State University imeni M.V. Lomonosov.

A.I. Alekseyev, M.L. Andreyeva, N.V. Gorbachev, G.A. Guseynov, S.Kh. Zhabbarov, S.P. Maslennikov, M.P. Romanov, A.V. Treshchev, A.Ye. Filimonov and A.G. Shukhov—"Transportation System for Flexible Automated Production on the Basis of the 'Elektronika NTs TM' Family of Mobile Robots." Recommended by the Zelenogradskiy Komsomol Raykom, Moscow, and the Moscow Institute for Radio Equipment, Electronics and Automation.

P.P. Almurzin, M.V. Nikitin, V.P. Safonov and S.F. Tsarkov—"Development and Creation of a Series of Aircraft for Initial Instruction and the National Economy." Recommended by the Kuybyshev Aviation Plant.

Sh.A. Alpeisov, Yu.A. Belozerov, A.V. Sergiyenko, O.A. Starchenkov, V.G. Tsoy, O.A. Tsoy and A.A. Chagelishvili—"Development and Introduction of Technology for Intensive Production of Goose Farming Products With a Significant Reduction in Labor and Resource Outlays." Recommended by the All-Union Scientific Research and Technological Institute for Poultry Farming.

Sh.A. Amonashvili—A cycle of works on the problems of upbringing children of a preschool and elementary school age. Recommended by the Georgian Komsomol Central Committee.

A.V. Andreyev, L.F. Makarova, M.V. Makarova, I.A. Rostovtseva, Yu.F. Kislitskiy, G.G. Poznyak, S.V. Shapovalenko, V.V. Pogosyan, O.S. Durzsova and V.P. Zolotov—"System for Automated LSI Circuit Design on a YeS Computer and its Application in Manufacturing Plants." Recommended by the Scientific Research Center for Electronic Computer Equipment.

V.P. Antropov, M.I. Katsnelson, A.I. Likhtenshteyn, I.I. Mazin, A.V. Postnikov and S.N. Rashkeyev—"Quantitative Theory of the Magnetic, Electrical and Optical Properties of Transition Metals, Their Alloys and Compounds." Recommended by the presidium of the USSR Academy of Sciences Urals Department and the Sverdlovsk Komsomol Obkom.

A.P. Arzin, I.I. Vintizenko, S.Yu. Galuzo, V.A. Kubarev, O.T. Loza, V.V. Mikheyev, A.G. Nikonov, Ye.V. Ilyakov, Yu.M. Savelyev and A.V. Fedotov—"Formation and Transport of Highly Accurate Electron Beams for Powerful Relativistic Microwave Electronics Systems." Recommended by the Komsomol Committee and the Council of Young Scientists at Moscow State University imeni M.V. Lomonosov.

A.A. Afanasyev, Ye.A. Afanasyeva, D.V. Voronin, V.A. Kuikovskiy, G.A. Lyamin, A.I. Sychev, P.A. Fomin and S.M. Frolov—"Non-Ideal Detonation of GAZ-Type Systems—Condensed Phase." Recommended by the USSR Academy of Sciences Siberian Department Institute of Hydrodynamics imeni M.A. Lavrentyev.

M.V. Baluda, M.V. Kamkamidze, L.V. Lyubina and I.K. Tlepshukov—"Diagnostics of Violations of the Antithrombogen Properties of Vascular Walls in Pathology and Methods for Restoring Them." Recommended by the USSR Academy of Medical Sciences Scientific Research Institute for Medical Radiology, the Moscow Medical Stomatological Institute imeni N.A. Semashko and the republic Orthopedic Surgical Hospital for Restorative Treatment of the Georgian SSR MZ.

S.A. Baranov, A.V. Gornakov, Ye.L. Karpukhin and M.M. Svinin—"Development and Application of Software for the Study and Design of Robotic Equipment and Vibration Protection Systems." Recommended by the Irkutsk Komsomol Obkom.

N.N. Batuyeva, V.G. Dolgikh, M.L. Kukushkin, Ye.Ye. Meyzerov and A.V. Chistyakov—A cycle of research on the comprehensive study of pain mechanisms and reflex methods of anesthetization. Recommended by the USSR Minzdrav TsNII for Reflex Therapy.

A.A. Belogradskiy, A.S. Dorkin, V.N. Zabavin, Yu.A. Kireyev, V.V. Novopashin, V.A. Panchenko, N.A. Petrova, V.I. Plastov, L.G. Shilin and S.N. Yakovlev—"Development and Introduction in Series Production of a Standardized Line of Yttrium-Aluminium Garnet Pulsed Lasers and Emitters, Designed on a Unified Modular Basis, For Technological Applications in Industry and Scientific Research." Recommended by an enterprise from the USSR Ministry of the Electronics Industry.

A.A. Bogdanov, A.F. Dukhovich, A.V. Kabanov, A.L. Klibanov, N.L. Klyachko, I.N. Kurochkin, Ye.L. Maltseva, N.V. Porodenko, M.G. Sergeyeva and Yu.L. Khmelnitskiy—"Physical and Chemical Study of the Regulation of Membrane Biocatalysts and Receptors." Recommended by the USSR Minzdrav Institute of Applied Molecular Biology.

A.Ya. Borshchevskiy, Ye.B. Rudnyy, N.S. Chilingarov and S.V. Krasulin—"Creation of Equipment and Development of Methods for Studying Compounds with High Electron Affinity." Recommended by the Komsomol Committee and Council of Young Scientists of Moscow State University imeni M.V. Lomonosov and by the Atomic Energy Institute imeni I.V. Kurchatov.

I.V. Buryakov, V.Ye. Galinnikov, I.M. Galtseva, V.N. Kovalev, V.A. Kreydich, N.G. Nadeyeva, M.D. Sarycheva, Ye.V. Safroshina, N.V. Sorokina and A.V. Shimanskiy—"Comprehensive Development of Materials and Technological Processes for the Production of Protective Screens, Ensuring Flight Safety of Civil Aviation Aircraft under Emergency Conditions." Recommended by the All-Union Scientific Research Institute for Aviation Materials.

V.N. Byzova, Ye.E. Zhukova and Ye.I. Zakharova—"Creation of Industrial Methods for the Synthesis of Vitamin K1 and the Disodium Salt of Phosphate dl-alpha-tocopherol for the Needs of Medicine and Microbiology." Recommended by the Moscow Institute of Fine Chemical Technology imeni M.V. Lomonosov.

I.V. Vinyar, S.M. Yegorov, Yu.Yu. Karzhavin, I.V. Miroshnikov, V.Yu. Sergeyev, A.P. Umov and S.N. Ushakov—"Development of New Diagnostics for Tokamak Plasma by the Macroparticle Injection Method." Recommended by the Leningrad Polytechnical Institute imeni M.I. Kalinin and the Atomic Energy Institute imeni I.V. Kurchatov.

S.B. Gavshin, G.A. Potapov and Yu.M. Kharlamov—"Quasi-spherical Detector of Cherenkov Radiation in Water." Recommended by MIFI and the USSR Academy of Sciences Far Eastern Department Pacific Ocean Oceanological Institute.

S.A. Galkin, V.V. Drozdov, A.A. Martynov, S.Yu. Medvedev, Yu.Yu. Poshekhonov, S.G. Bespoludennov and V.D. Pustovitov—A cycle of works, "Mathematical Modeling of MHD Equilibrium and Stability of Plasma in Systems with Magnetic Containment." Recommended by the USSR Academy of Sciences Institute of Applied Mathematics imeni M.V. Keldysh.

S.R. Gildenskiold, L.A. Komyazhenkova and O.R. Mikhaylov—"Hygienic Questions of Creating Closed Water Resource Systems for Industrial Enterprises and Complexes." Recommended by the Moscow Medical Institute No 1 imeni I.M. Sechenov.

S.K. Golikov, L.N. Grishkov, L.B. Gutkovskiy, V.V. Kulachenkov, V.V. Lukin, M.V. Mazun, A.B. Olshanskiy, A.G. Slemzin, V.I. Tarakhtunov and A.P. Timofeyev—"Development of New Powdered Materials and Progressive Technologies for Obtaining Objects and Coatings." Recommended by the "Tulachermet" Scientific Production Association and the Tula Komsomol Obkom.

D.B. Dzhusupova and A.B. Manasbayeva—"Intensification of the Microbiological Cleansing of Sewage from Toxic Compounds." Recommended by the KaSSR Academy of Sciences Institute of Microbiology and Virology.

Yu.Ye. Dubrova, K.M. Ikramov and A.N. Kucher—"Risk Factors of Human Prenatal Mortality (A Population-Genetic Study)." Recommended by the USSR Academy of Sciences Institute of General Genetics imeni N.I. Vavilov.

I.N. Yevtyutova, L.Ye. Grafeyeva and T.S. Chikirina—"Study of a System of Chromium (VI)-Zinc-Alkali Metal As Applied to the Purification and Regeneration of Concentrated Chromium-Containing Sewage from Galvanizing Industries." Recommended by the Chelyabinsk branch of USSR Gosstroy VNIIvodgeo.

S.Yu. Ivanov and A.V. Krylovskiy—"Improvement of a Gas Collector Joint and of the Alumina Charging of Aluminum Electrolyzers with a Top Current Lead." Recommended by the Moscow Institute of Steel and Alloys.

I.Ye. Inzhevatkin, S.A. Stanchits and N.G. Tomilin—"Physical Bases for the Breakdown of Strata and Methods for Predicting Rock Bursts." Recommended by the USSR Academy of Sciences Physical and Technical Institute imeni A.F. Ioffe.

M.Yu. Karganov and L.S. Godlevskiy—"Neuropeptides in the Occurrence and Elimination of Neuropathological Syndromes." Recommended by the USSR Academy of

Medical Sciences Scientific Research Institute for General Pathology and Pathological Physiology.

B.Z. Kasymov, I.V. Kosnikova, M.M. Alimov and F.A. Klebleyev—"Experimental Substantiation for the Use of Hemosorption in the Comprehensive Treatment of Serious Ischemia of the Extremities." Recommended by the Tashkent branch of the USSR Academy of Medical Sciences VNTsKh.

M.M. Kozlov, S.I. Sukharev, S.L. Leykin, G.B. Melikyan, O.M. Parnev and Ye.Ye. Yegorov—"Structural Reconstruction of Membranes: Electrical Disruption, Lysis, Consolidation." Recommended by the USSR Academy of Sciences Institute of Electrochemistry imeni A.N. Frumkin.

I.V. Kochikov, I.V. Radin and M.Yu. Semenov—"Radioautography and the Probabilistic-Statistical Spectrometry of Charged Particles Using Hard-Body Nuclear Track Detectors: Identification and Quantitative Analysis." Recommended by the Odessa State University imeni I.I. Mechnikov.

I.V. Kukushkin—"Divided Hall Quantum Effect in Silicon Metal-Dielectric-Semiconductor Structures." Recommended by the USSR Academy of Sciences Institute of Hard Body Physics.

Yu.A. Lebedev—"Development of Force Elements and Study of Their Effect on Rock Masses." Recommended by the Gorno-Altay State Pedagogical Institute.

L.V. Levantovskiy, K.V. Malkov, I.G. Mamedov, A.L. Nersisyan, S.V. Nikitin and V.I. Sizikov—"Qualitative Methods for Analysis of the Stability, Complexity and Stabilization of Dynamic Systems." Recommended by the Komsomol committee and young scientists council of the USSR Academy of Sciences VNII for Systems Research.

I.Ye. Litvin, V.V. Vysochanskiy, A.S. Strekopytov, A.P. Pozdnyakov, V.P. Borodavkin, M.D. Semanishin, A.V. Yeremeyev, S.A. Yegurtsov, A.A. Sedykh and K.P. Konovalov—"Development of a Technical Diagnostics System for Main Gas and Oil Pipelines to Ensure the Reliability and Efficiency of Their Operation." Recommended by the Komsomol committee of the USSR Ministry for Construction of Petroleum and Gas Industry Enterprises and the "Soyuzorgenergogaz" Production Association.

Ye.V. Lobanov, V.N. Artamonov, I.V. Viktorova, I.V. Grushetskiy, S.V. Kravchenko, A.N. Polyakov, A.V. Popov, G.Zh. Sakhvadze, S.V. Sokolovskiy and M.S. Strekalova—"Development and Introduction of Methods for Increasing Machine Reliability and Life." Recommended by the USSR Academy of Sciences Institute for Machine Sciences imeni A.A. Blagonravov.

S.V. Mitrokhin, V.S. Zontov, S.N. Klyamkin, S.I. Kuliyev, A.N. Sytnikov and M.V. Lototskiy—A cycle of works "Creation of Highly-Efficient Metal-Hybrid Materials for the Accumulation of Hydrogen." Recommended by the Komsomol committee and young scientists council of Moscow State University imeni M.V. Lomonosov and by the UkSSR Academy of Sciences Institute of Machine Building Problems (Kharkov).

A.B. Molitvoslovov, O.G. Skipenko, I.M. Buriyev, V.N. Yegiyev, M.M. Zhadkevich, S.A. Kapranov, N.N. Ionochkina, Yu.T. Kadoshchuk, I.V. Kozlov and I.P. Englin—"New Methods for Surgical Treatment of Diseases of the Pancreas." Recommended by the USSR Academy of Medical Sciences All-Union Scientific Center for Surgery.

R. Muradov and O.Sh. Sarimsakov—"Improvement of Pneumatic Transport System Elements for the Purpose of Preserving Fiber and Seed Quality and Reducing Their Loss." Recommended by the Namangan branch of the Tashkent Institute for Textile and Light Industry imeni Yu. Akhunbabayev.

S.A. Nepogodyev, N.E. Nifantyev and Yu.Ye. Tsvetkov—A cycle of works "Chemical Synthesis of Regular Natural Polysaccharides—Plant Glucose and Bacterial Hexose-Aminoglucose." Recommended by the USSR Academy of Sciences Institute of Organic Chemistry imeni N.D. Zelinskiy.

S.F. Nikonov, S.I. Mikhaylin, Ye.Z. Golukhova, I.V. Kruglyakov, G.V. Mirskiy, I.I. Pilshchikova, V.V. Chernyshov, A.Yu. Bredikis, M.I. Laan and M.A. Shkolnikova—"Clinic, Diagnosis, Prognosis and New Approaches to the Treatment of Non-ischemic Forms of Heart Rhythm Disturbances in a Young Person." Recommended by the USSR Academy of Medical Sciences Institute of Cardiovascular Surgery imeni A.N. Bakulev.

V.V. Neroyev, L.V. Blagodatnyy, V.V. Kislov, A.A. Oganesyan and S.A. Korotkikh—"Development of New Comprehensive Methods for the Diagnosis and Treatment of Patients with Penetrating Fragment Wounds to the Eyeball." Recommended by the Moscow NII for Eye Diseases imeni Gelmgolts.

M.A. Osipov and A.N. Semenov—Cycle of works on the physics of liquid crystals, polymers and liquid-crystal polymer systems. Recommended by the Komsomol committee and young scientists council of Moscow State University imeni M.V. Lomonosov.

V.V. Pokrovskiy and Z.K. Suvorova—"Scientific Development and Practical Application of Measures to Prevent the Spread of AIDS in the USSR." Recommended by the USSR Minzdrav TsNII for Epidemiology.

B.Ye. Simkin, A.V. Antonenko, Yu.V. Karpachevskiy, A.O. Lebedev, I.Ye. Kavych, A.A. Kupriyanov, D.Ye. Mashtakov, N.F. Chishinskiy and S.N. Kalinichenko—"Development, Application and Study of Digital Regulators for the Main Regulation Circuit of Nuclear Power

Plants on the Basis of ASUT-1000-2 Technical Systems in Power Units with the VVER-1000 Reactors." Recommended by the Zaporozhye Nuclear Power Plant.

S.Yu. Storozhenko—"Insects with Incomplete Metamorphosis (Orthopterans and Bird Lice) of the Far East." Recommended by the USSR Academy of Sciences Far Eastern Department Soil Biology Institute.

A.S. Shamayev—"Mathematical Tasks of the Theory of Elastic Composite and Perforated Elastic Materials." Recommended by the USSR Academy of Sciences Institute of Problems in Mechanics.

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Suggested Upgrading of Lenin Prize by Reducing Candidates' Number

18140247a Moscow IZVESTIYA in Russian 17 Mar 88 p 3

[Article by Academician Zh. Alferov, director of the Physical Technical Institute imeni A.F. Ioffe, Leningrad: "How to Award Lenin Prizes"]

[Text] In the years that we now call stagnant, a devaluation of high titles and rewards took place. The prestige of state prizes waned and markedly fell in the eyes of the public. Circumstantial considerations and an ardent desire to please people in high places sometimes assumed the ascendancy even in nomination of candidates for the competition for the most respected prize in the country—the Lenin Prize. Fortunately, two circumstances prevented a precipitous drop in its prestige. The first is that it is awarded to a person only once in his life, and no one has yet succeeded in violating this set rule and becoming a winner at least twice. The second is that candidates for it have always been much fewer than for the state prize.

Does this mean that the Lenin-Prize statute does not need any corrections or changes? Not at all. From my point of view, it possesses all the defects characteristic of the statute on state prizes. They simply are not so obviously expressed.

The numerical structure of the authors' collective seems extremely important to me. In distinction to the State Prize where its limit is 12 persons, a collective half that large—6 persons—is permitted to compete. In my opinion, even this figure is also too large, in any case for works in the field of science. The experience of international prizes, verified over many decades of scientific practice shows that a reasonable level to the authors' collective is 3 persons, and not more. It is difficult to imagine that 6 scientists could be full-fledged authors of a discovery or a very important invention. On the other hand, conflicting situations in the determination of candidates arise most frequently in those cases where the number of competitors reaches a level that is maximally permissible according to the rules.

At the same time, the boundary line between real creative participation and basic contribution to a work is being eroded. Often local patriotism is in operation: although true authors can be counted on the fingers of one hand, the administrators of an institute or some other scientific institution try to fill all vacancies—for them it is more prestigious to receive six medals rather than one or two. After all, one begins to forget with the years how many works in this institution were singled out by a prize, but every one remembers how many prize winners are here.

A brief digression. This year gold medals imeni M.V. Lomonosov were received by Aleksandr Mikhaylovich Prokhorov and Dzhon Bardin, one of the greatest physicists of modern times and the only scientist who has been awarded two Nobel prizes in one field of science.

I have known Dzhon Bardin a long time. I met him at Illinois University almost 20 years ago. Of course, I would have liked to be the first one to congratulate this remarkable scientist. A business trip to the United States made this possible.

In an interview by a local newspaper, the scientist said that he particularly esteemed the award since it is conferred by the USSR Academy of Sciences and he considers himself to be an follower of the Soviet school of theoretical physics, especially Landau's school. But when we met and I explained that the Lomonosov gold medal marks the highest level of recognition of scientific services, Bardin immediately asked the question: "Who received it before me?"

Actually, the prestige and significance of a scientific award depends to a large extent on whom it was previously conferred. The Lenin Prize is a special case. Still.... The years pass, and it turns out that among its winners quite average scientists are mentioned who have in no way shown themselves to be first rate in science, neither before nor after. Only a lucky concurrence of circumstances permitted them to find themselves a single time in the same row with people of truly great talent.

I am deeply convinced that the probability of finding oneself among casual authors and second-rate candidates will be unavoidable until the number of competitors is reduced to three persons.

The size of the monetary reward according to today's standards or compared to others with much less prestigious payment is too small. But it is considered improper for some reason or other to refer to this aloud. We are hesitant to say the truth: the top national prize should be the highest in all its respects.

Once in order to boost higher the prestige of Lenin Prizes, it was decided to award them once in 2 years. This measure does not appear justified. Prizes of such a high rank ought to be yearly. Besides, in the field of

science (and possibly not just in it), it would be advantageous to set up a prize for physics, for chemistry, for biology and so on. Without attempting to determine at this time the degree of importance of different fields of knowledge, we need to think which of them should be combined and which ones to be singled out individually. But it is clear that the authority of an award, its prestige of an award sharply grows when it stands alone. Let us say, the Lenin Prize for Mathematics for 1988. It sounds like it would be an extremely high honor for a scientist.

One could object, that it is very unlikely that works worthy of the award could appear each year. Well, we should not hurry, but wait until they happen. And we will not be upset in the case that some year turns out to be very fruitful for great inventions and discoveries, for example, in chemistry or physics. There is nothing terrible about it, let something wait in progress. Better to give the prize later than award it to work of low quality.

In the history of Soviet science, laureats of the Lenin Prize must stand forever not because they have become laureats, but because their achievements have received recognition in our country and in the whole world.

Environmental Problems Require Reallocation of S&T Resources

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[Article by S.A. Volfson and N.S. Yenikolopov: "Thoughts on the Benefits and Harm of Chemistry"]

[Excerpts] Let us point out at the outset that chemists talk and write with pleasure about their achievements, but usually remain silent when it comes to the negative consequences of their own work. They do not even like to speak of this even in their narrow circle. It is considered all right to humorously recollect explosions and fires and how someone had inhaled something or other.

Occupational diseases? Allergy? The necessity of frequently turning down experimental work by the time they are forty because of chronic illnesses? Yes, this is all true, but it should be looked at as inevitable payment for a fascinating life in science.

But not all chemists work in science? Not everybody by this age becomes an administrator? Still there is milk, a shorter workday and at many production facilities free food and an early time period to go on pension. These are all benefits meant to compensate for excessive vocational injuriousness.

Since ancient times, work with many chemical substances has been considered harmful. Not without reason were slaves, war captives and prisoners frequently used in these operations. Medicine became interested in vocational diseases and began to systmatically study them around the beginning of our century. Ideas of vocational risk, harmful occupations and level of harmful concentrations appeared.

Preventive measures for workers employed in the chemical complex are one of the workers' achievements. And how should one deal with those who live next to dangerous production facilities and use or employ chemical products in their activities?

A sanitary inspectorate is intended to watch over their interests. Each new product, material or item undergoes special tests. Some materials are suitable for contact with and storage of food products, others are not. Some are recommended for household use, sewing of underwear and clothing, others are prohibited. The number of new products and materials is constantly changing. Our ideas of harm and usefulness of those already known are changing.

The press recently reported on the tragic events at several metallurgical plants where argon is used in large quantities.[1] But this is a harmless inert gas! That is what is written in all textbooks and instructions. Actually, it is harmless in small concentrations. But when this heavy gas is used on a large scale and it, colorless and odorless, fills the premises, it forces air from them, and one inhalation of it becomes fatal!

Synthetic fibers are one of the major achievements of chemistry. Their wide-scale use instead of silk or wool evoked raptures among authors of popular-science articles. But subsequently it turned out that many people wearing clothing of synthetic fibers had unpleasant sensations and allergic illnesses. In the United States, more than 25 percent of the children are sick with different kinds of allergies. The number of allergic ailments is growing precipitously throughout the entire world and in our country as well. What is the reason for this?

Medical personnel reply that this is due to wide-scale employment of synthetic medicines, detergents, air pollution and synthetic food additives. Allergies constitute the dark side of the use of chemicals in our lives. But if only they were allergies.

Chemical processes of transforming substances are linked to the absorption and release of energy, utilization of water, air, solid, liquid and gaseous mineral products and the formation of a tremendous amount of various wastes and byproducts. These wastes contaminate the earth, the water and the atmosphere. Very rarely are they harmless, considerably more often, unfortunately, harmful and dangerous. Even harmless wastes and products of our activities, accumulating in large quantities, are capable of becoming malicious turncoats. It is enough to recall the balance of carbon-dioxide gas in the atmosphere.

Diverse wastes of consumption should be added to industrial wastes. Leaks of petroleum products in the sea and coastal waters have repeatedly resulted in catastrophic consequences. Plastic refuse is contaminating the World Ocean and the land since it is not biologically degradable.

Medical personnel have introduced the concept of maximally permissible concentrations of harmful substances in air and water around industrial enterprises. These are the vaunted MPC [PDK] around which so many copies are destroyed. Norms of permissible impurities are gradually becoming more rigid, and sanitary protection zones around enterprises are being expanded. Not so long ago, within our memory, wastes were simply dumped into water bodies or transported a distance away and then thrown on heaps, buried or burned. Today fines are issued for this everywhere.

Some types of wastes have begun to be collected for processing. The number of such wastes is constantly growing. The idea emerged of building waste-free or low-waste production facilities. For economy of energy, it is proposed to develop energy-conserving processes.

In other words, the chemists are not sitting doing nothing—progress in the matter of protection of nature from the action of chemistry is seemingly at hand. What is the reason for this universal indignation?

There are several answers to this question. It is simplest of all to say that the growth of overall measures for protection of nature from the harmful action of the

chemical complex is unable to keep up with the development of the chemical complex itself. The accelerated overall development of industry is to blame. A technology which was quite useful yesterday is today with mass use the source of pollution. Protective norms are becoming obsolete. It is frequently impossible to keep up with their revision. Certain threshold possibilities of nature have been overcome to accumulate and to biogenically decompose chemical products.

When a report appeared several years ago that moths have "learned" how to feed on nylon, most chemists greeted it with disappointment. Yet another attempt to develop an "everlasting" material had failed. In the light of modern ideas on ecology, this was one more defeat by nature of irrational mankind.

Industrial production facilities of gigantic size are now being created more rapidly than scientists are able to conduct basic research and to work out a scientifically valid conception of the development of this or that region. Such was the case with Lake Baykal, Kara-Bogaz-Gol and the Caspian lowlands.

The global consequences of our industrial activities in most cases turn out to be quite unexpected for engineers. They were not taught to calculate the remote results of such activity. Narrow technicism [tekhnitsizm] and the absence of a humanitarian view of nature as something unique, departmental ambitions and the wrongly understood honor of the uniform exacerbate the state of affairs.

If passions seethe around the majority of "plans of the age," then what can one say of existing production facilities, in most cases long physically and otherwise obsolete, with which the chemical complex is so rich in? The existence of a modern, effectively operating system of purification of emissions and discharges at a chemical enterprise—is this a pattern or accident, a rule or exception to the rule? We have reliable statistics, but we all understand how difficult it is to meet the enterprise's director who is tranquil about the state of affairs relating to the protection of the environment at the plant entrusted to him.

Scientific and Economic Problems

Incidentally, all these passions may not concern a scientist of the academic type. Concentration and development of production have resulted in negative consequences? This is logical and law conforming. It will be necessary to increase allocations for scientific research. Theories of modeling have been developed, and qualified scientists exist. The problem of harmful emissions, wastes and discharges of chemical production facilities is theoretically solvable. It is always possible to develop a chemical, physical or biological way for their elimination, modification, neutralization or transformation into valuable products.

Such a formulation of the question will not elicit any enthusiasm in a staff member of a sectoral scientific-research institute. They, workers in applied science, definitely know that any operation with wastes and emissions is linked to the need of having additional equipment and expending additional power and materials. In any case, all this acts as a heavy burden on the production cost of the basic product, which needs to be reduced and not raised.

For those who plan, finance and locate production facilities of the chemical complex, the problem is even more acute. The criterion of economy demands maximal reduction of capital and current outlays on the creation of any production facilities. Otherwise, effectiveness is reduced, payback time periods for invested funds are lengthened and it becomes more difficult to "extricate" these funds and so forth.

Yes, in principle ways of eliminating almost all harmful production wastes exist or can be developed, but where do you get the funds for working out and developing them? Already at the present time, the share of funds expended on purifying discharges and emissions is reaching 30 percent. If we add to this everything we have not completed and all unpaid debts, then we have a tremendous sum of many tens of billions of rubles.

Even the actual formulation of such a question appears inept for many departmental specialists participating in the work. Well, one cannot seriously speak of a significant increase in production costs of the chemical complex solely because of tightening of demands relating to protection of nature. You cannot plan the expenditure of vast state funds for measures that do not provide an increase in production output.

And yet we hear on radio and television, read in papers and journals of the opinion of competent specialists: do you want to enjoy modern comforts? Do you want to have electricity and heat in the house? Do you want to read newspapers and journals, eat to satiation and walk around fashionably dressed? Resign yourself. Resign yourself to the pollution of rivers, lakes, the land and the atmosphere. Resign yourself to the destruction of wildlife, birds and fishes. Resign yourself to the diseases of the 20th century. This is inevitable. It is an objective consequence of scientific and technical progress.

Break the Stereotype

Sarcastic people have originated a pithy saying: chemistry or life! But let us not be in a hurry to agree, for our futuree and the future of our children and grandchildren has been put on the chart. Let us put emotions aside. Let us assume that we want to both conserve nature and to feed people and to provide them with clothing, energy and comfort, albeit on the level of the world standards of our time. Is this problem so unresolvable as the departmental representatives want to persuade us?

For this, we need first of all to revise certain ingrained stereotypes. Let us return to the criterion of economy. It is because of it that purification systems and "burdensome" plans are being cut to a minimum and are being built last or sometimes just remain on paper. Because of it technological regulations are frequently violated at existing production facilities and these try to economize on power and materials in purification.

Attempts are made to fight this evil, and violators are fined and educated. This helps, but not much. Incidentally, more effective measures being used abroad are known. Sensors and instruments continuously controlling the situation surrounding production are under the jurisdiction of local organs of government. Under the conditions of glasnost, we can count on these local authorities to cease "assuming the position" of heads of production facilities.

It is more difficult to radically change the psychology of personnel of planning organs. An open extradepartmental expert examination of plans is needed. It is necessary to boost in every possible way the prestige and responsibility of commissions of experts. They should involve specialists of a broad profile. It would be ideal to combine such an expert examination with competitions of plans or at least their technical and economic validations.

It might appear to be easiest of all to restructure science. But here you have in operation a rather rigid system of priorities: to prestigiously engage in a new process, a new product or a new material. Purification of sewage and utilization of wastes are much less prestigious. One often wishes for someone else to do this. But in what technological scientific-research institute do these problems occupy a dominant position? Yes, and how many have received Lenin or State prizes, orders and honorary titles for making purification equipment?

And yet it is time to give this the highest merits. It is time to put this problem in the place of highest priority. This is no joke for it is necessary to restructure **most of the existing industrial technologies.** It is time to restructure in this context basic science. It is time to start systematic propaganda among scientists and engineers. It is time to teach schoolchildren and students differently. On the whole, the creation of new technologies and improvement of old ones are only half the job. We need to learn to economize on water, to collect wastes and trash and to rescue each plot of land from contamination. It is necessary to inculcate a new ecological culture.

Oppressive Leadership

Let us turn to the example of those of our neighbors who before us, due to higher development of the chemical complex, have encountered negative factors they gave rise to. Let us turn to the United States. In the past 10 years, significant changes, which have also applied to the chemical complex, have occurred there. First of all, production of pig iron and steel has been sharply curtailed and many metallurgical plants have closed down. Over the course of many decades, we thought that the production volume of these materials determines a country's economic might. In the name of what have the Americans voluntarily ceded primacy to us?

Two convincing reasons are to be found. The first is that production and processing of metals is extremely energy-intensive. The second is that metals rust quickly despite all measures for protection against corrosion. The result is that a significant portion of produced metal goes into replacement of rust, and the more we produce metal, then proportionally the greater are the losses. Does not the chief reason for the paradox in which our industry finds itself lie in this? We produce more metal than anyone in the world, more than the United States, Japan and West Germany combined, and yet we do not have enough of it.

Of course, a negative role is played by the great metal intensiveness of equipment, irrational use and low quality of metal.

How do the United States and other developed countries find their way out of this situation? They now have relied for a long time on the development of production of plastics and structural materials. These materials require significantly less power in their production and processing, and they age more slowly. A steel pipe can become unserviceable after 3-5 years and under especially difficult conditions within 1.5-2 years. Plastic pipes are servicable for 30-50 years or more. Polyethylene and glass-reinforced plastic withstand the most aggressive environments. In addition, polymers are significantly lighter than metals. On this basis, there is a boom in their use in aviation, motor-vehicle building and the production of other means of transport. The reduction of mass means again reduction of power consumption. Finally, processing of plastics is much cheaper than processing of metals.

We produce twice as much metal as the United States but only two-ninths of the plastics.

In the production of mineral fertilizers, we have outdistanced all the developed capitalist countries, but we have not obtained adequate yields from agriculture. It is now being proposed to accelerate the development of production of agents for protection of plants. All these substances are by no means harmless. In case of improper use, they inflict more harm than good. Chemists can fulfill the social order: develop technologies and organize production. Not without reason do we have for this an entire Ministry of Mineral Fertilizer Production. But who guarantees the effectiveness of use of these substances? The proofs are debatable and frequently unconvincing. Hurry in decisions is fraught with major oversights as has happened more than once. Actually, do we need primacy in the production of mineral fertilizers and pesticides, or would it not be better to cede it to others?

Criticism of the technical policy of the Ministry of Water Management attained tremendous scope. The water shortage in our southern regions and at the same time salinization of the soil are all the consequence of use of an obsolete technology. Canals and irrigation ditches were good in the old days. Ceramic drainage pipes are also a technology that has outlived its time. It is also high time to change over to plastic pipes, from watering to subsoil irrigation, for the useful expenditure of water in watering amounts to only several percent.

Several years ago, a number of laws were adopted in the United States pertaining to the operation of the chemical complex. For example, consumption of energy was to be reduced by 25 percent and harmful emissions into the atmosphere by 30 percent. Very likely these laws did not evoke joy in heads of chemical firms. But they had to be carried out under threat of ruinous fines and under rigid control without any sort of compensation. At the same time, the production volume of the chemical industry grew 10 percent in the last 5 years.

These are achievements of the United States. But in Western Europe, the European Parliament adopted a law according to which the use of any polymer film and plastic packing, if they are not biodegradable, will be forbidden to be used beginning with 1991. One can imagine what despondency reigned in the camp of the producers of widely used plastics—polyethylene, polystyrene, polyvinyl chloride and others.

In a number of European countries, bonuses were introduced for sorting trash at the time it is thrown out: plastic wastes into one container, metal into another and glass into a third. A processing industry of wastes and trash is rapidly developing. Today it still seems to us that the life-support cycles developed for spaceships are something close to the fantastic. Before we know it, they will be passed on to Earth from space.

The Fate of Old Industrial Centers and New Technologies

These facts as well as numerous others cited in the press oblige us to think of a most stubborn conductor of traditional technical policy. But it is quickly coming to its senses. Of course, it states, when one deals with the creation and location of new production facilities, it is necessary to take into account the achievements of scientific and technical progress. And we have something to boast about. Thus the new process of synthesizing polycarbonate, a valuable structural plastic, is vitally needed for the development of our industry, and it was made with the most modern requirements.[3] Not without reason has a whole line been formed of foreign firms wishing to acquire it. At the same time, phosgene, a military poisonous agent of the time of World War I, is used in the production of this plastic.

We can point out personally that this material is actually very much needed, and now the greater part of it is purchased here by people from abroad. Members of the party and trade unions of the city of Ufa on whom fell the selection of plans have not provided for assurances of specialists and their guarantees in regard to improvement of protection measures. It is enough to recall the lessons of Bhopal and Chernobyl. Furthermore, the situation in the city, which is so overfull of chemical production facilities, is most depressing. The construction decision was rescinded.

But why, one asks, should it be necessary to locate a potentially dangerous production facility within the confines of the city? Many of today's problems come together as in a focus in this question. The city was selected as a place of construction according to canons which have been legal for tens of years. Here you have a site, raw materials, power, water, manpower resources and a developed infrastructure. Outlays on construction are minimal. They would be much larger in any other place in the country. Harm from production, dangerous emissions? But, pardon me, the plan provides for excellent systems of protection plus large funds for building up the adjacent area. The city would only gain (this is the planners' opinion). After all, local administrators only a year ago easily and simply signed all the documents.

Yes, indeed a year ago everything was easy and simple. The fact is that no one not on the inside knew anything about it and consequently did not interfere. But now the mistakes in planning will cost dearly.

The situation in Ufa is typical: we have about 100 old industrial centers in a comparable condition. They are in need of pressing treatment and occasionally surgical intervention. This has already happened in Yerevan where it was found necessary to close down production of synthetic rubber, which was important for the country but significantly polluted the air.

It is understandable why planners strive to locate new production facilities or intensified old ones in populated places. It is cheaper, but the people's interests are lost sight of. At one time, plants were built on the outskirts. However, the cities grew and the plants found themselves surrounded by residential blocks. Removal of chemical production even from Moscow is a most difficult problem. Let us remember how many years were spent on reshaping the Dorogomilovskiy Chemical Plant. Several plants still continue to pour smoke in Moscow.

The problem of reshaping the Shchekino Chemical Combine located next to Yasnaya Polyana is a complex one. So far they have not succeeded in solving this problem at the Kuskovskiy Chemical Plant despite the adoption of a number of measures relating to this question.

But still departments or those who may replace them will have to remove chemistry from the cities. The time has already arrived, and it is not necessary to bring this

matter up to open conflicts. We need to urgently develop a state program reshaping production.

The New Technical Policy

Ideas on organization of modern chemical technologies have already been formulated. They have to be waste-free, or in an extremity low-waste, energy-conserving, highly efficient, integrated. The development of such technologies is a problem of exceptional complexity. We have not been accustomed, for example, to save energy—it costs pennies and little influences the production cost of chemical products. We have not made it a habit to save water for the same reason. Traditionally, we give preference to more simple and reliable solutions, although their time quite possibly has passed.

Here are two more examples from the history of polymer technology. One concerns polyformaldehyde, a structural plastic, included together with polycarbonate in the group of engineering plastics. Like polycarbonate, it was first developed in the beginning of the'60s. We in our country conducted in parallel the development of two variants of technology. One was complex, energy-intensive. Actually this was a reproduction of a foreign one. The other was original, economical but less reliable.

In selecting a variant for industrial implementation, on one side of the scale was placed the greater reliability of the process and on the other all the remaining advantages. It is not difficult to guess which of these technologies was given priority by managers of industry.

Natural gas rather than petroleum, as for the majority of other polymers, is the raw material for production of polyformaldehyde. This as well as the outstanding properties of the material drew attention to it throughout the entire world. However, due to the complexity of the technology, this plastic has not received the same dissemination up to the present time as have polyethylene, polypropylene or polystyrene.

Recently, the Japanse Asahi firm worked out a cheap, economical process for synthesizing polyformaldehyde and in a short time developed capacities of 100,000 tons a year. And this in Japan, where the market is saturated with polymers! The basis of the process consists of ideas which we developed 20 years ago.[3] But our process of direct synthesis from a monomer has remained on the level of an experimental industrial installation.

Even more surprising is the fate of domestic polypropylene. We possess a tremendous raw-material base for the development of production of this very valuable plastic. After all, our country was a pioneer in the development of an original and economic process of synthesis without the use of a solvent. The first industrial installation was established in the beginning of the'60s by specialists from the Institute of Chemical Physics of the USSR Academy of Sciences and technologists of the Moscow Petroleum Refining Plant.[4] But in this case some unfinished work and quality of the product permitted critics of the domestic technology to insist on purchasing the obsolete technology from abroad.

About 20 years passed, and leading producer firms of polypropylene adopted a technology close to the one which was worked out in our country. We have to actually restart development anew, while tremendous quantities of a most valuable raw material are burned as exhaust flames of petroleum refining plants.

In principle, everybody agrees to the fact that Soviet developers need to get a "green light." But this is in words only. In practice, the economic mechanism is structured in such a way that departments and even heads of production find it incomparably more advantageous to initiate the purchase of an imported technology in "turnkey" form so that everything is ready. In this connection risk is reduced to a minimum and the same for responsibility.

Mass purchases of a complete technology have resulted in sad consequences. Our own developments landed on the shelf, and the industry of chemical machine building began to lag catastrophically.

An incorrect understanding by certain managers of industrial of the so-called Japanese phenomenon—rapid development of the Japaneses chemical complex on the basis of purchased licenses—lies at the basis of many mistakes of economic policy.

Full employment of the developments of modern technology, cooperation of efforts with foreign partners and familiarization with international experience are necessary. But by means of participation **on an equal basis** instead of "turnkey" purchases. Let us recall that as the result of an intelligent economic policy Japan is becoming quickly transformed from an importer of technologies into their largest exporter. And were we to compare technologies purchased by us and those sold abroad, it would be sad. The balance is not in our favor.

On the Method of the Carrot and the Stick

Restructuring of the chemical complex for ecologically clean processes in parallel with its accelerated development (one must not forget that despite the surplus of metal and fertilizers we are acutely in short supply of most of its products) is a tremendously complex problem. It requires not only solid capital investment but also the mobilization of scientific, engineering and worker thought, a great strain on resources, a rise in the effectiveness of science, retraining of personnel and improvement of qualifications.

An extremely uneven distribution of scientific resources among different sectors of the chemical complex has developed among us, and the proportions in the actual

science have been disturbed. A shortage exists everywhere of modern instruments, office mechanization equipment, chemical agents, testing bases, laboratory and experimental technological equipment. Over the course of many years, we acquired by hook or by crook instruments and equipment for hard money instead of investing this money into the creation of our own production facilities for these instruments and equipment.

The piling up of problems can make anyone despondent, but we shall place our hopes on the healing strength of restructuring of the national economy. The awakening of a feeling of social responsibility in producers instead of economic interest as the result of their work and rather than just plan fulfillment should provide an effect.

It is very important to break down departmental isolation and to learn to concentrate scientific and engineering forces on the main directions of work. It is necessary to break the diktat of head sectoral organizations resulting in a monopolization of science.

Scientists lack information on the real state of affairs in industry. Most of it is "secreted" by departments and is accessible to an extremely limited number of people. On the other hand, heads of enterprises often simply do not know whom to turn to for help. A way out of the situation is suggested by practice—intermediary cooperative information centers. And indeed there has been created the VNTITsentr [All-Union Scientific and Technical Information Center (?)] which could assume the functions of a chief coordinator.

Each sector his its own scientific and technical journal. However, there are few advertisements, proposals and orders in them. Foreign scientific and technical journals provide a surfeit of this information. The time has come for our journals to be obliged to fill the information vacuum. Heads of enterprises and even scientific-research institutes must have the possibility of publically ordering developments they need regardless of departmental affiliation. Scientists, engineers and inventors should have the possibility of advertising (really advertising!) their results.

Today the channels of such information are odd: newspaper articles, popular-science journals, television programs, feuilletons, exhibits and so forth. All this is done in bits and pieces and often incompetently. The real problems of the chemical complex should be brought to each member of a multi-thousand group of scientists. Where there is no information, there can be no ideas.

Interrelations of science and production are still poorly regulated. The author's right to an invention in its modern form provokes particularly many criticisms. Deliberate restrictions, the incredible complexity of "knocking out" rewards and the practically total absence of inventors' rights—all this does not promote progress.

The possibility of a broad and free union of creative individuals and collectives continues to be held back by a mass of bureaucratic impediments. As of now we can only dream of flexible and dynamic ties of science with production. It is charcteristic that the number of temporary collectives created in recent years is commensurable with the number of decrees regulating their activities.

The frequent ineffectiveness of decisions promulgated "from above" is shown by our own work experience on the creation of a technology for processing polymer wastes. The amount of these wastes is tremendous: about 1.5 million tons of tires worn out annually, 250,000 tons of wastes from plants engaged in industrial rubber products, hundreds of thousands of tons of wastes of products made from polyvinyl chloride, polyesters, polyurethanes and other plastics, synthetic fibers, textiles, and leather and several million tons of cellulose-containing materials (wastes of woodworking, crop growing and the cellulose industry). Let us compare the total volume of these materials with the annual production volume of plastics. Only an insignificant part of these synthetic and natural polymers, totaling up the large amount of power expended on their manufacture, is reprocessed. The rest is burned, buried or thrown out.

No decrees (and there have been many of them) succeeded in solving this problem until the enterprises became interested in it. But even in the presence of interest in the creation of waste-free production, an effective technology is still needed. We succeeded for the first time in proposing such a technology based on fine grinding of various polymer materials into a powder with a minimum outlay of power (so-called elastic deformation technology).[5] The results of the laboratory experiments conducted at the Institute of Chemical Physics of the USSR Academy of Sciences and testing work performed at several plants made a big impression on many domestic and foreign specialists.

The powders are not a final product, but by means of methods of powder technology it is possible to produce from them various materials and products. For example, a portion of the rubber powders can be used as an addition to rubber mixes. It is possible to produce from these powders composite materials, coatings, asphalt and concrete mixes with improved qualities, a liquid binder for briquetting coal, porous hoses for subsoil irrigation with whose assistance it is possible to save more than 90 percent of the water used for watering and so on.

Of course, a special technology is required each time for processing a powder into a concrete product. With intensive work it should be possible to return to industrial use in several years a tremendous amount of valuable polymer materials, which are now irrevocably lost and in addition pollute the nature around us.

We proposed this technology about 8 years ago. So far it has been introduced only at several enterprises. Why? After all the economic benefit has been proven. The answer is such: we do not have specialized equipment, there are no complete lines for processing powders. Not

a single enterprise of the Ministry of Chemical Machine Building wants to engage in its development. USSR Gossnab and several ministries discussed the problem but evidently got scared because of the scale of the tasks involved and their complexity. Certain ones, for example, the Ministry of Procurement, came out categorically against it because the new technology (waste-free!) undermined the standards existing in the sector.

At the present time, our Bulgarian colleagues have become interested in the new technology. Requests and proposals are coming from foreign firms. Will it not happen again as has occurred more times than one that a domestic technology will return to us from abroad paid for generously by us with hard currency?

The chemical science and industry of our country face tremendously complex problems. Let us deal with them with all the seriousness that they deserve.

Physicians, on receiving a diploma, take the Hippocratic oath. Is it not time for chemists to take an oath of fidelity to Nature.

Footnotes

1. Sazonov, G. "They Did not Return Home from the Shop." // PRAVDA, 18 Feb 1988, p 6.

2. Volfson, S.A., "Osnovy sozdaniya technologicheskogo protsessa polucheniya polimerov" [Bases of Creating the Technological Process of Production of Polymers]. Moscow, 1987, p 80.

3. Ibid., pp 77-78, 164-165.

4. Ibid., p 77.

5. Enikolopian, N.S., Akopian, E.L. and Nikolsky, V.G. // "Makromol. Chem. Suppl.", 1984, Vol 6, pp 316-330; Enikolopian, N.S. //Ibid., Vol. 8, 109-117.

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Results of Poll on Perestroyka in Science

18140319b Moscow NTR: PROBLEMY I RESHENIYA in Russian No 12, 21 Jun-4 Jul 88 p 1

[Article by L. Averyanov, sociologist, candidate of philosophical sciences, and V. Baronin, correspondent: "Results of a Reader Survey on Restructuring in Science: Maneuvers on the March." Passages in boldface as published]

[Text] The third CPSU Central Committee Thesis for the 19th All-Union Party Conference states:

"The party's basic economic and social strategy is to accelerate scientific and technical progress and, above all, to master the achievements of its contemporary stage, related to the development of leading technologies—microelectronics, robotics, instrument building, information science, biotechnology."

This resolution in a certain sense is inarguable, as, obviously, is the fact that without restructuring in science itself it would be simply impossible to do anything of great importance. What is taking place in science, how is restructuring going, what is forcing it to speed up and what slows it down? We asked the readers of this year's sixth issue of NTR a number of questions on this subject.

We will be honest: we did this not without making waves. Some workers on the editorial board and certain representatives of the writers collective thought that science had begun a new time as of 1 January and it was not worth talking about "last year's snow." We must, they say, prepare ourselves to cover the triumphal procession of innovations.

There were also opinions along the following line: in the period of stagnation, science, both academic and sectorial, accumulated an enormous inertia and withdrew from the key problems of developing the economy and even from knowledge itself. Industry caused this, because it was busy fulfilling the plans and was not interested in innovations.

It is easy to see that the second viewpoint originates from the fact that restructuring in science is even more difficult than it is in industry. However, science had somewhat less time to prepare than economics had, which means that the problems should also be more complex.

In our opinion, the results of the poll confirm this interpretation of the situation. Only 2 percent of those surveyed (we analyzed several hundred questionnaires) stated that restructuring is going fairly actively; 37 percent think that it is going fairly slowly; and 61 percent see no signs of it.

Let us leave this data without commenting for now. We shall address another question. Last October, the editorial board held its first reader survey on ways to improve our publication and, nine times out of ten, we received neatly filled out questionnaires. The picture changed when it was a question of restructuring in science: more than 20 percent of readers sent articles written with pain and hope, with suggestions for improving this process, a critique of the facts and factors which hinder restructuring (excerpts from the more interesting opinions and suggestions were published in NTR, No 9). What does this mean?

Today's engineer, specialist or scientist is a very busy person. There is a mass of work at his job, and in the evening he must mandatorily, even if by halves, digest the tremendous flow of daily information which the idea of democratization and glasnost is causing. Where can he find time to correspond with a newspaper? It seems that

if even one in five respondents wrote from 5 to 20 pages, at least three would have wanted to do this.

Hence, it is no great leap to conclude that workers in science have a fairly high social activeness and that their psychological restructuring has already occurred. Is this true?

Thirty-eight percent responded to the question on personal participation in restructuring "yes, fairly actively;" the same number responded "not very actively;" while 24 percent stated that they virtually do not participate in restructuring at all.

It is not easy to interpret these data. However, if one likens participation in restructuring, for example, to an airline flight, then slightly over a third of the possible passengers have taken their seats, the same number reached the airport, and slightly fewer (24 percent) have not yet taken even a step away from their old haunts.

However, this is only the visible part of the iceberg. The outlines of the underwater part are revealed by the answers to the question: what does the course of restructuring depend on? Here, it seems, we should show the readers an excerpt from the table of survey results. This is how it looks:

Response	Percentage
Mainly on leaders	60
Equally on everyone	38
Mainly on ordinary workers	2

We should not rush to conclusions. Leaders can accelerate or obstruct the course of restructuring by holding key positions, formulating the goals and tasks of their collectives, determining ways to achieve these goals, and finally, correcting the course of work. After agreeing with this, it is appropriate to ask: how do they behave in this rather nontrivial situation?

After asking this question, true, in several different forms, we received some fairly interesting answers:

Response	Percentage
Leaders are working actively and to the point	8
Leaders are doing little for restructuring	25
Leaders are doing virtually nothing but talking	67

Thus, only 2 percent of those who answered our questionnaire think that restructuring is taking place in science, and doing so fairly actively, while 38 percent think that they are actively participating in it.

More than 50 percent are convinced that the course of restructuring depends primarily on leaders. At the same time, about 70 percent are convinced that these leaders are doing nothing and are only talking. This is what the second underwater part of the iceberg looks like.

From all of this, it is easy to conclude that restructuring in science is occurring with difficulty, contradictorily and rather slowly. This is natural, to a certain extent.

Nonetheless, we thought it would be interesting to discover the reasons that are hindering restructuring, particularly when this process is just starting to develop. Without claiming to exhaust all possible reasons for this hindrance, we offered the readers six answer variants, any number of which could be selected. The readers' opinion on the factors which are hindering restructuring to the greatest extent were as follows:

Response	Percentage
It is not beneficial to high-ranking leaders	67
Lack of new organizational forms	65
Lack of economic incentives	56
Insufficient democracy and glasnost	46
Lack of psychological restructuring	44
It is not beneficial to ordinary workers	16

An interesting point: from the viewpoint of the survey data, the leader has become a unique center of attention. In the readers' opinion, the course of restructuring basically depends on him (60 percent), he is doing nothing (67 percent) except talking, and finally, restructuring is not beneficial for him (67 percent).

If one is to agree with these opinions, the problem of restructuring can be solved quite simply: we must replace today's leaders, who are sluggish and lack initiative, with others who will be able to breathe new life into the old bellows.

I. How has the work of scientific subdivisions changed over the last 2 years?

Response	Percentage
Has begun working better	5
Virtually nothing has changed	84
Has begun working worse	11

II. Is there a need to introduce some new forms for organizing scientific work?

Response	Percentage
Yes	63
Combined with old forms	33
Leave the old forms	4

III. Is there a need to introduce new forms for applying scientific developments?

Response	Percentage
Yes, new forms are needed	74
Combined with old forms	24
Leave the old forms	2

We should disillusion our readers at this stage. Unfortunately, this is a utopia which, on the one hand, originated in the system of command-administrative management methods, and on the other, is an idea which does not justify itself in practice. Look at the newspaper files for any central or oblast newspaper for a year, and you will see that the replacement of leaders sometimes moves in a second and third circle, but the problem does not change.

In this connection, Academician T.I. Zaslavskaya's opinion is interesting. She thinks that the number of supporters of restructuring is growing. "However, at the same time," she writes, "a certain consolidation of those social forces which oppose restructuring and which would give dearly to see the previous system of social relations remain for a long time is also occurring. The opponents are essentially middle management employees. If we try to describe this, albeit roughly, we see that the tops of society are essentially 'for' restructuring, the bottom of society is also 'for,' and the middle link to a significant extent is 'against' it."

Involuntarily, a question comes up: where—"up above," "in the middle," or "down below"—is the leader of the scientific collective, and what standard should be applied to his actions from the viewpoint of Academician T.I. Zaslavskaya? We think that he is somewhere between the middle and the lower link. Incidentally, the "in between" position is the most complex of those which exist in general.

On the one hand, there is the democratization of management at the collective level.

On the other hand, the ministries and departments are turning the screws under the pretense of raising the effectiveness of work.

In the third place, there is the 1985-1987 legislative and norm-setting activity, the nature of which has remained at the level of the late 1960s-early 1980s, which clearly does not conform to the tasks of revolutionary restructuring.

"Incidentally," we quote the leading article of the last issue of EKO, "the tasks of the period of stagnation qualitatively differed from those of the forthcoming revolution. The legislative and norm-setting activities of the 1970s-1980s (and it was active) have shaped a status quo in the form of law. Today, in the logic of restructuring, the same laws should help to break the status quo, to change it and not strengthen it. In actual fact, laws are being drafted and passed one after another which are elevating deformed systems to the rank of legal procedures and are thus strengthening them."

A briefcase full of materials presently at the disposal of NTR editors also attests to the abnormality of this situation.

Self-support and self-financing, given eroded and incorrect norms imposed "from above," are still, so to speak, just tiny flowers. Self-management, self-planning, self-development and finally, self-defense still do not exist and therefore it is also no surprise that, as before, many leaders are working to please those "above" them and perceive everything else as the "folly of follies." This will remain precisely so, and not otherwise, until the command-bureaucratic management methods are overcome.

We believe that the problem of removing the obstacles in the path of those who can and want to work fruitfully in contemporary domestic science is indeed the social order of NTR readers for the 19th All-Union Party Conference. In precisely this manner, it is possible to determine the opinions of hundreds and thousands of readers, troubled by the destinies of restructuring in science.

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